Erasmus+

University of Ruse

Faculty of Electrical Engineering, Electronics and Automation

UNIVERSITY OF RUSE

FACULTY OF ELECTRICAL ENGINEERING, ELECTRONICS AND AUTOMATION

Erasmus ECTS Information Package

Assoc.Prof. Vyara Ruseva, PhD
Dean
University of Ruse
8 Studentska Street
7004 Ruse
tel.: + 359 82 888 616
E-mail: vruseva@uni-ruse.bg

Assoc.Prof. Anka Krasteva, PhD
Faculty ECTS Coordinator
University of Ruse
8 Studentska Street
7004 Ruse
tel.: +359 82 888 301
E-mail: akrasteva@uni-ruse.bg

TABLE OF CONTENTS

General Introduction ... 3
- The ECTS System ... 4
- Data about Bulgaria ... 5

Information on the City and the University ... 8
- The City of Ruse ... 9
- The University of Ruse ... 11
- Academic Calendar ... 12
- Profile of the University of Ruse ... 13
- International Activity ... 14
- Admission of Foreign Students and Application Procedures, General Information, Visas, Accommodation, Useful Information ... 16
- Campus Map of the University of Ruse ... 23

Information on the Faculty of Electrical Engineering, Electronics and Automation ... 24
ECTS & ERASMUS Coordinators ... 34
Departments in the Faculty of Electrical Engineering, Electronics and Automation ... 35
Department of Electrical Power Engineering ... 36
Department of Automatics and Electronics ... 39
Department of Computer Systems and Technologies ... 42
Department of Telecommunications ... 45
Undergraduate Programs ... 48
- Undergraduate Studies in Electrical Power Engineering ... 49
- Undergraduate Studies in Electronics ... 82
- Undergraduate Studies in Computer Control and Automation ... 113
- Undergraduate Studies in Computer Systems and Technologies ... 146
- Undergraduate Studies in Internet and Mobile Communications ... 178
- Undergraduate Studies in Information and Communication Technologies ... 212

Postgraduate Programs ... 243
- Postgraduate Studies in Electrical Power Engineering ... 244
- Postgraduate Studies in Renewable Energy Sources and Technologies ... 253
- Postgraduate Studies in Electronics ... 264
- Postgraduate Studies in Automotive Electronics ... 276
- Postgraduate Studies in Automatics and Computer Systems for Automation ... 287
- Postgraduate Studies in Automatics and Mechatronics ... 295
- Postgraduate Studies in Computer Systems and Networks ... 303
- Postgraduate Studies in Computer Systems and Technologies ... 313
- Postgraduate Studies in Internet and Multimedia Communications ... 324

GENERAL INTRODUCTION

THE ECTS SYSTEM

The Information Package provides a description of the University of Ruse, of the Faculty of Electrical Engineering, Electronics and Automation and the courses offered by the Faculty in order to help prospective ECTS students to prepare for their study period at this institution.

What is ECTS?

ECTS, **The European Credit Transfer and Accumulation System,** was developed by the Commission of the European Communities in order to provide common procedures to guarantee academic recognition of studies abroad. It provides a way of measuring and comparing learning achievements and transferring them from one institution to another. The European Commission promotes the system and the international cooperation between universities as a means of improving the quality of education bringing benefits both to students and higher education itself. In this respect, student exchange is the basic element in university cooperation. Recognition of education and diplomas is the necessary condition for establishing an open European higher education space where students and lecturers can “move” with no restriction.

ECTS provides **transparency** through the following means:

- **ECTS credits** which are a numerical value allocated to course units to describe the student workload required to complete them;
- **The Information Package** which supplies written information to students and staff on institutions, departments/faculties, the organization and structure of studies and course units; it also provides useful information about the location of the University, its admission procedures, accommodation opportunities, academic calendar, etc.
- **The Transcript of Records** which shows students’ learning achievements in a way which is comprehensive, commonly understood and easily transferable from one institution to another;
- **The Learning Agreement** covering the programme of study to be taken and the ECTS credits to be awarded for their satisfactory completion, committing both home and host institutions, as well as the student.

The ECTS Credits

ECTS credits are allocated units to describe the student workload required to complete them. They reflect the quantity of work each course requires in relation to the total amount of work required to complete a full year of academic study at the institution, i.e. lectures, practical classes, seminars, self-study – in a library or at home - and exams or other assessment activities. ECTS credits express a relative value.

In ECTS, **60 credits** represent the workload of a year of study; normally **30 credits** are given for a semester and **20 credits** for a term. It is important that no special courses are set up for ECTS purposes, but that all ECTS courses are mainstream courses of the participating institutions, as followed by the home students under normal regulations. Credits are awarded only when the course has been completed and all required examinations or other assessment activities have been successfully passed. Detailed information about disciplines (short description of course contents, teaching methods, types of assessment, etc.) is given in the information package of each degree programme.

ECTS Students

Students participating in ECTS receive full credit for all academic work successfully carried out at any of the ECTS partner institutions. These credits are transferred to the home university and fully replace the annual/semester workload including exams and other forms of assessment. In this way students can study abroad for a certain period of time and when they come back, they are able to continue their education without any loss of semesters and exams. Some students may also decide to graduate from the host university, and permission for that is given by the academic authorities based upon the student’s transcript of credit points and his/her performance at the home university.

DATA ABOUT BULGARIA

The Republic of Bulgaria is a country situated in South-East Europe. In the north it borders the Republic of Romania, in the east it ranges to the Black Sea, in the south it neighbours the Republic of Turkey and the Republic of Greece, and in the west it borders (former Yugoslavian) Republic of Macedonia and Republic of Serbia.

Area: 110,993.6 sq km

Population: 6 911 661

Capital city: Sofia

Official language: Bulgarian

Alphabet: Cyrillic

Religion: There is freedom of religious confessions. Traditional religion in the Republic of Bulgaria is Eastern Orthodox Christianity

National holiday: March 3, the Day of the Liberation of Bulgaria from Ottoman domination (1878)

Public (non-working) holidays:

3 March – Liberation Day (national holiday)

1 January – New Year

Easter (Resurrection of Christ) – two days (Easter Sunday and Easter Monday)

1 May – Labour Day (the Day of International Working Class Solidarity)

6 May – Day of Bravery and Bulgarian Army, Gergyovden (St. George's Day)

24 May – Day of Bulgarian Education and Culture, and of the Slavonic Alphabet

6 September – Unification Day

22 September – Independence Day

1 November – Day of the National Revival Leaders

24 December – Christmas Eve

25 and 26 December – Christmas

Monetary unit: the Bulgarian Lev (BGN)

Administrative division: 28 regions, named after their respective regional centres

State system: a parliamentary republic with a one-chamber parliament (National Assembly), consisting of 240 national representatives, elected for a four-year term of service. The head of state of the republic is the President, elected for a five-year term of service. The Council of Ministers is the main body of executive power.

Climate: moderate continental with Black Sea influence in the east and Mediterranean in the south.

Water: rivers (main rivers are the Danube, Maritsa, Mesta, Strouma, Iskar, and Yantra); warm and cold mineral springs (more than 600)

Transport: railway, automobile, air and water

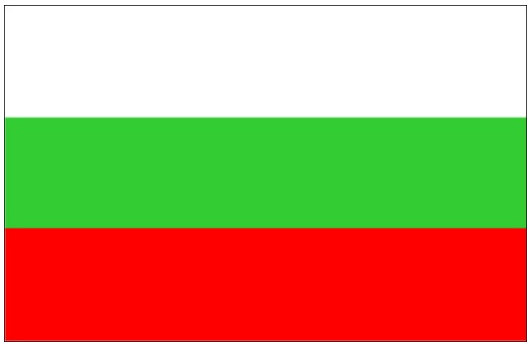
International automobile sign: BG

International telephone code: +359 ……..

International telephone code for Ruse: +359 82 ……..

Official Symbols of Bulgaria

The national flag of the Republic of Bulgaria is in three colours: white, green and red bands, following horizontally from top to bottom.



A legend associates the origin of these three colours with the colour symbols of the Old Bulgarian Army. Its left wing was set apart by white strips on the spears, the right one by red, while arranged in the centre were the elite troops with a green strip, the traditional colour of the ruler. The three-colour flag was first used by the First Bulgarian Legion of Georgi Rakovski (1861). By force of the Turnovo Constitution (1879), the three-colour flag - white, green and red, was confirmed as Bulgaria's national flag.

The coat-of-arms of the Republic of Bulgaria is a rampant gold crowned lion against a dark-red background in the form of a shield. Above the shield there is a big crown, whose original shape was that of the crowns of medieval Bulgarian rulers, with five crosses and one other cross, separately, over the crown itself. The shield is supported by two golden crowned rampant lions, facing the shield from the left and right heraldic side. They are standing on two crossed oak tree twigs with acorns. Inscribed in golden letters onto a white strip with a three-colour edging, placed under the shield across the ends of the oak twigs, is ***Union is Strength.***

The Bulgarian Landmarks in the UNESCO List of the World Natural and Cultural Heritage

Kazanluk Tomb
A Thracian tomb, dated to the late 4th-early 3rdcentury B.C. The murals in the burial chamber and in the corridor are of exclusive artistic value. The tomb is located in the Tyulbeto Hill near the town of Kazanluk.

Ivanovo Rock Churches
A rock monastery compound of the Holy Archangel Michael, with partially preserved churches. The murals in the Church of the Holy Virgin have been described as some of the most significant achievements of 14th century Bulgarian medieval art. The churches are located about 20 km away from the city of Ruse, east of the village of Ivanovo, in the rocks of the Rusenski Lom Nature Park.

Boyana Church
It has unique murals from 1259, considered among the masterpieces of medieval European painting. It is at a distance of about 8 km from the centre of the city of Sofia (in the Boyana residential district), in the foothills of Mount Vitosha.

Madara Horseman
A rock relief, cut into the Madara rocks on the northern slope of the Provadiisko Plateau at a height of 23 m. This is the most significant monumental piece of art from the early Middle Ages, unique of its kind in European cultural history. It is close to the village of Madara, about 16 km away from the city of Shumen.

Rila Monastery
The most impressive monastery compound in Bulgaria of exceptional architectural and artistic merits. Founded in the 10th century, rebuilt in the 13th-14th century, a literary centre in the 15th century and completed in its present-day striking appearance during the 19thcentury. A spiritual centre of the Bulgarian people, it is located in the northwest part of the Rila Mountain, about 20 km from the town of Rila and about 120 km from Sofia.

Nessebur, the old part of the town
An architectural, historical and archaeological reserve at the Black Sea coast with valuable archaeological relics from different periods, original churches from the 5th to the 17th century and authentic National Revival Period houses.

Sveshtari Tomb
A Thracian tomb from the first half of the 3rd century B.C. The central burial chamber has exceptionally lavish decoration and impressive caryatides in high relief. It is located close to the village of Sveshtari, 7 km northwest of the town of Isperih.

Sreburna Reserve
A biosphere reserve in the valley of the Danube, including the Sreburna Lake and its surroundings. It has been established for the preservation of rare plant and animal species. It is 16 km west of the town of Silistra.

Pirin National Park
It is part of the scenic Pirin Mountain. Located in the high parts of the Northern Mount Pirin, it is characterized by a specific relief and an inimitable plant and animal world. It also incorporates the Bayuvi Dupki - Dzhindzhiritsa Biosphere Reserve and the Yulen Reserve.

INFORMATION ON THE CITY AND THE UNIVERSITY

THE CITY OF RUSE

Welcome to Ruse

" ... All that I experienced afterwards had already been in Roustchouk"

Elias Canetti

Ruse is the biggest Bulgarian port town on the bank of the river Danube. After the opening of the Rhein - Main - Danube canal which covers 3,500 km and connects thirteen European countries with the Near and Far East via the Black Sea, the river becomes the longest inland waterway on the planet.

This key position has determined the nineteen century long co-existence of town, river, and people, carrying the unique atmosphere of history as a precious heritage, and of future as an open road full of promises. The Romans were the first to build the fort which they called Sexaginta Prista (the port of sixty ships). Then came others, from Europe, leaving their indelible imprint in this intersection of material and spiritual culture, followed by the imbued with the zeal of drive and enterprise Bulgarians, who gradually turned the place into a centre of the Bulgarian national revival. The very name Ruse became a synonym of economic growth and cultural rebirth.

The nineteenth century saw here the opening of the first Bulgarian printing house, the first model farm, the first Bulgarian railroad connecting Ruse with Varna, the first Bulgarian weather service, the first technical school and technical society, the first professional teachers' club, the first insurance agency, the first chamber of commerce and industry, the first inland navigation service on the Danube, the first teletel, the first moving picture show, the first Bulgarian newspaper, the first geography map.

New industries sprang up, banks and trade agencies were founded and European shipping agencies, as well as 17 foreign consulates were established. A large number of Bulgarian, Austrian, Italian, and Swiss men of arts created the wealth of architectural forms and styles characteristic of the period in Europe: Neoclassicism, Neo-baroque, Neo-gothic style, Art Nouveau, and Fin du siecle.

The town hosted a vast variety of multinational ethnic groups, which the Nobel writer Elias Canetti defined as a microcosmos of two dozen nationalities. French, German, Italian, Jewish, Armenian, Turkish, and other schools, boarding houses and churches, reading clubs, theatres and music halls, museums and bookshops, opened their doors to help diversify the cultural life of the city in its steady march towards enlightenment. In this completed picture of social life, today the town is still rediscovering its true face, spanning a bridge across cultures in the new context of integrated Europe.

THE UNIVERSITY OF RUSE

On **12 November 1945** the first out-of-capital higher education institution was founded in Ruse as an engineering school. Its three departments were specialized in Engineering for the purposes of the agricultural sector.

On **13 June 1966**, as a result of its intensive growth, the Minister of Education issued an Order No. 2583 to set up a Higher Institute of Mechanical Engineering, Mechanization and Electrification of Agriculture.

On **9 April 1981,** due to the widened scope of its engineering provision, including the sectors of transport, electronics and computing, it was transformed into 'Angel Kanchev' Technical University by a Decree No. 584 of the Council of Ministers.

On **1 August 1995** a Decision of the National Assembly was made to convert the Technical University in "Angel Kanchev" University of Ruse, thus recognizing its academic expertise not only in the engineering fields, but also in natural sciences, education, law, public health and healthcare, business and management, which were introduced as a response to the needs of the regional businesses and the community.

Mission statement of Ruse University

The University aims to provide:

Dissemination of knowledge,

excellence in fundamental and applied research and

introduction of innovations in practice,

which will help it to train highly-qualified specialists and

maintain the sustainable development of the region and the country.

ACADEMIC CALENDAR

The academic year at the University of Ruse starts in September and is divided into two semesters – Fall and Spring. Each semester consists of:

- 15 weeks of classes;
- 4 weeks of regular examination session;
- 1 week for supplementary examination and 1 vacation week after the fall semester;
- Summer holidays (4-8 weeks) start after the end of the examination session and last till the beginning of the new academic year or till the beginning of the annual supplementary examination session in September for those students who have to resit exams left from the previous year.

The organisation of the training process is realised in the framework of the *Academic Calendar*, which is adopted each year by a resolution of the University's Academic Council.

PROFILE OF THE UNIVERSITY OF RUSE (UR)

Name of higher education institution	**University of Ruse "Angel Kanchev"**
Type of higher education institution	**State University**
Location and address	**8 Studentska Street, 7004 Ruse, Bulgaria**

Rector Assoc. Prof. Desislava Atanasova, MEng, PhD

Number of students for the academic year 2024-2025: more than 7100

Number of international students: 174 from 27 countries

Number of PhD students: 136

Full-time academic staff: 373 (203 full and associate prof; 18 Doctor of Sciences; 316 with a PhD degree)

Number of degree programmes offered:

51 Bachelor and 120 Master degree programmes in 7 of the 9 fields of study in higher education in Bulgaria (Engineering and Technology; Agricultural Sciences and Veterinary Medicine; Social Studies, Economics and Management, and Law; Natural Sciences, Mathematics and Informatics; Pedagogical and Humanities Sciences; Health Care and Sport; Security and Defence).

The University of Ruse is the only university in Ruse, Razgrad, Silistra and Targovishte districts (with a population of approximately 1 million), which complies with the international index "one higher education institution per one million people".

The University of Ruse is a full member of:
- European University Association;
- Danube Rectors' Conference;
- Visegrad University Association;
- Interuniversity Center-Dubrovnik;
- Balkan University Association.

The University of Ruse was accredited by the National Evaluation and Accreditation Agency for a six–year period with the grade – 9,01 out of 10.

International activity

The University of Ruse is significantly enhancing its international engagement through active participation in a variety of initiatives, including:

- Scientific and applied research programs of the European Union, such as HORIZON Europe, the Digital Europe Program, and Life.
- EU scientific and educational programs like ERASMUS+, ERASMUS MUNDUS, and Marie Skłodowska-Curie Actions.
- National and transnational programs e.g., the “Research, Innovation and Digitization for Smart Transformation” (2021-2027), the Recovery and Resilience Plan, the INTERREG Danube Region Programme (2021-2027), the INTERREG Romania-Bulgaria Programme, the EEA Financial Mechanism, the Norwegian Financial Mechanism, as well as Science for Peace and Security Program, COST actions and CEEPUS.
- Collaborative programs with China through the Confucius Institute and partnerships with the French Institute (Institut français de Bulgarie).
- We have established bilateral cooperation agreements with over 130 universities and research institutes across 31 countries, further strengthening our global academic network.

The University is committed to organizing and participating in international events, joint trainings, and summer schools; it also offers mutually recognized diplomas and provides quality education and opportunities for professional realization.

The University of Ruse is one of the first Bulgarian universities which started its participation in the ERASMUS programme. Now there are more than 600 bilateral agreements signed with universities and companies from 60 countries around the world (30 of them from EC). At least 80 undergraduate, post-graduate and PhD-students are annually involved in all EU exchange programmes.

Admission of foreign students

Terms of study:

- ***For a Bachelor's degree*** – 4 years;
- ***For a Master's degree*** – 1 or 2 years depending on the Bachelor's degree acquired;
- ***For a Doctoral degree*** – at least 3 years.

Bachelor degree programmes at the University of Ruse

Faculty of Agricultural and Industrial Engineering:

- Agricultural Engineering
- Ecology and Environmental Protection
- Agricultural Machinery and Technologies
- Air-conditioning, Hydraulics and Gas Supply
- Equipment Maintenance and Management
- Industrial Design
- Design
- Plant Growing

Faculty of Mechanical and Manufacturing Engineering:

- Industrial Engineering
- Material Science and Technologies
- Mechanical Engineering
- Quality Management and Metrology
- Civil Engineering

Faculty of Electrical Engineering, Electronics and Automation:

- Electrical Power Engineering
- Electronics
- Computer Control and Automation
- Computer Systems and Technologies
- Internet and Mobile Telecommunications
- Information and Communication Technologies
- Information and Communication Technologies (in English)

Faculty of Transport Engineering:

- Transport Engineering and Management
- Transport Engineering

Faculty of Natural Sciences and Education:

- Bulgarian Language and History
- Informatics and Information Technologies in Business
- Computer Science
- Primary School Education with a Foreign Language
- Pedagogy of Education in Mathematics and Informatics
- Pre-school and Primary School Education
- Software engineering
- Social Pedagogy
- Financial Mathematics

Faculty of Business and Management:

- Business Management
- Digital Management and Innovations
- Economics
- Industrial Management
- Public Administration

Faculty of Law:

- Law

- Crime prevention and public order maintenance

Faculty of Public Health and Health Care:

- Social Activities
- Kinesitherapy
- Occupational Therapy
- Nursing
- Medical assistant
- Midwifery

Silistra Branch:

- Automotive Engineering
- Electrical Engineering
- Pedagogy of teaching Bulgarian and Foreign Languages (English, Romanian)
- Pedagogy of teaching Physics and Informatics
- Pedagogy of teaching Mathematics and Informatics

Razgrad Branch:

- Biotechnologies
- Chemical Technologies
- Food Processing Technologies

Vidin Branch:

- Bulgarian Language and History
- Electronics
- Agricultural Machinery and Technologies
- Industrial Management
- Computer Sciences
- Transport Management and Technology

Other University Units and Services

- Quality of Education and Accreditation Directorate
- Public Relations Directorate
- Foreign Students Directorate
- Student Admissions and University Registrar
- Scientific Research Sector
- University Computing and Information Services Center (UCISC)
- Center for Distance Learning
- Center for Innovative Educational Technologies
- International Cooperation Department
- Center for Continuing Education
- Center for Career Development
- University Library

The language of instruction for students in Bachelor and Master Degrees is Bulgarian.
The University of Ruse offers 2 Bachelor and 1 Master degree programmes in English

Bachelor degree programmes

- Information and Communication Technologies.

Master degree programmes

- European Studies and Regional Cooperation (in English and German).

Application Procedures

General Conditions and Documents for Admission of Foreign Students

Foreigners, who hold a high school diploma, giving them access to universities in the country issuing this diploma, are eligible for admission into the University of Ruse.

Preparatory Year

During their first year at the University foreign students study Bulgarian in a 10-month intensive course, tailored to meet the needs of linguistic and specialist training of international bachelor, master and PhD students. The course is organized by the Foreign Students Directorate.

Tuition Fees

Foreign citizens, studying at Ruse University, pay tuition fees. The fees are paid in two installments: at the beginning of the academic year and at the beginning of the second (spring) semester.

For sending applications and for more detailed information foreign applicants can address:

Foreign Students Directorate
University of Ruse
8 Studentska Street
7004 Ruse
Bulgaria
tel.: +359 82 888 281
E-mail: chs@uni-ruse.bg

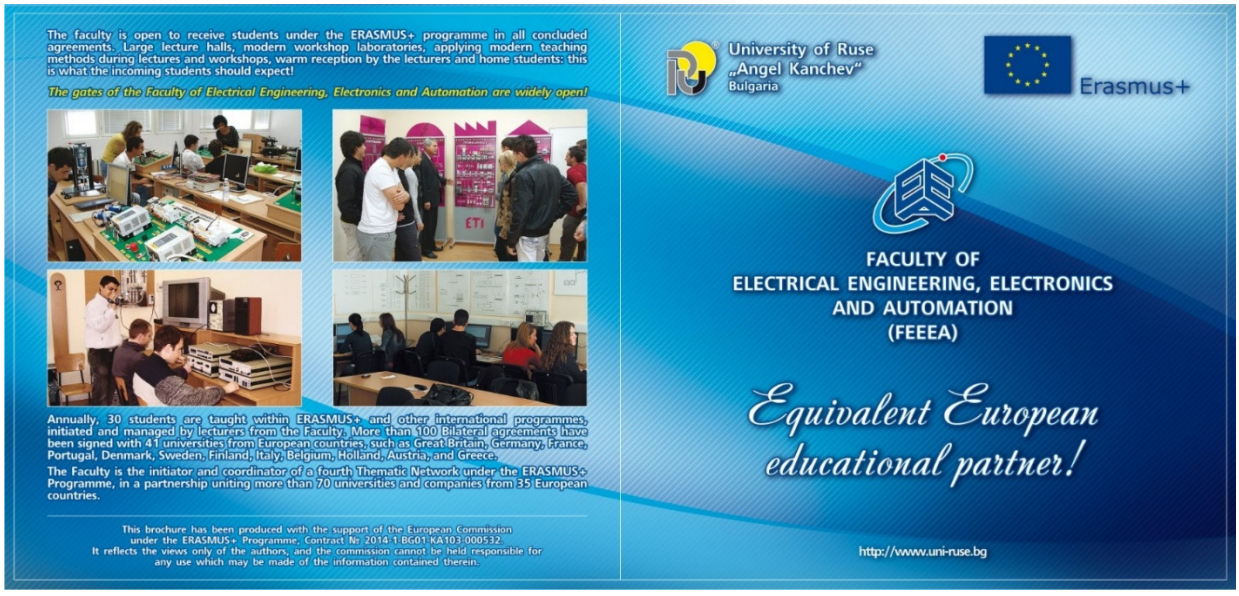
Application documents and procedures for admission of foreign students within exchange programmes of the European Union

Application and admission of international students to different programmes of the European Union are prepared in compliance with the individual bilateral or international agreements.

For international students, who wish to study at the University of Ruse within the ERASMUS programme, selected courses are offered in English. The list of these courses can be found on the university WEB site. https://erasmus.uni-ruse.bg/en/?cmd=cmsPage&pid=29

For sending application forms within ERASMUS and for more detailed information foreign applicants can address the International Cooperation and Erasmus Office:

International Cooperation and Erasmus Office
University of Ruse
8 Studentska Street
Ruse 7004
Bulgaria
tel/fax: +359 82 888 650
E-mail: eims@uni-ruse.bg
https://erasmus.uni-ruse.bg/bg/?cmd=gsIndex



General Information

Visa Requirements

According to the Law for Foreigners' Stay in the Republic of Bulgaria, each foreigner may enter the country with a valid passport (or other ID document) and an entry visa for Bulgaria. Entry visas are issued in all Embassies or Consulates of Bulgaria abroad. *No visas are required* for citizens of the countries of the European Union and of a number of other countries as well. On arrival in Bulgaria, every foreigner, if not accommodated in a hotel, should, within 24 hours, register his/her address with the Passport Service for Foreigners. Foreigners who are admitted as students at the University of Ruse should present their documents for admission issued by the University. This will allow them to get permission for longer stay in the country after their entry visas expire.

Traveling to Ruse

The distance from Ruse to Sofia (the capital city of Bulgaria) is 315 km.

The distance from Ruse to Bucharest (the capital city of Romania) is 60 km.

Travel to both capital cities is by train and by bus.

There are also provisions for quick and easy transport to various parts of the city and other regions of the country

After arriving at the University each international student is welcome to contact the International Cooperation and Erasmus Office.

Living Expenses

The optimum amount of living expenses is connected with a balanced budget, including subsistence costs, accommodation costs, medical services, public transport, food and public services, tuition costs (for EU member country students) and some other expenses. Minimum living costs are achieved through the use of the refectory and through modest expenses for transport and other public services. Under these conditions, the average living expenses may range from 150 to 250 Euro per month.

Accommodation and on-campus facilities

Accommodation can be found in several sectors:
In one of the many hotels in Ruse. The approximate price for a single room is about 40 – 80 Euro per night. ***In one of the cheaper hotels***. Offering less comfort, or in single rooms in hotel chains at prices about 15–25 Euro per night. ***Renting a flat.*** The rent for such a flat (1 to 3 rooms) varies from 150 to 350 Euro per month depending on the degree of comfort, furniture and location. Rents exclude expenses for electricity, hot water, central heating and telephone, which may cost about 50–100 Euro per month.

The University of Ruse offers very good on-campus accommodation for 2400 students at rents of about 50 Euro per month. There are eight student hostels, two of which are for families.

The University of Ruse on-campus facilities offer excellent opportunities for study, research, recreation and sport. The student hostels, the refectory, the medical centre, the post office, the sports facilities and the student culture club are all situated on campus, which is surrounded by green parkland and is within easy reach of the city parks, the river Danube and the city centre.

The University of Ruse offers on-campus sports facilities for volleyball, basketball, table tennis, bodybuilding, football, field and track events and other sports. The sports teams and clubs for football, athletics, volleyball, basketball, handball, aerobics and calisthenics are the responsibility of qualified teachers, which explains why they often win first prizes at various competitions.

There is a variety of amateur clubs, forming the Student Cultural Club Society, which was established in 1954. Examples are the Folk Dance Theatre, the Artists Club, the Pantomime Studio, the Drama Society, the Photographer's club, the Literature Club, the Modern Dance Society, and the folk dance band. Their guidance is entrusted to distinguished performers, artists and musicians.

The Tourist Society ACADEMIC unites a variety of clubs: for mountain climbing, water sports, skiing, cycling, rock climbing, mountaineering, speleology and cross-country walking. They attract large numbers of students, faculty members and administrative staff, who can take holidays in the university resort centres on the Black Sea coast, in the Balkan mountains, or along the bank of the Danube.

Medical Services and Insurance

There are many clinics, hospitals and private surgeries where you may ask for qualified medical help paying cash at quite reasonable rates. You may also get medical insurance in one of the numerous insurance companies in Bulgaria.

Other Useful Information

Public Transport: Trams, buses and trolley buses are the main public transport in Bulgaria. Tickets are sold at bus stations (bus stops), at newspaper stands or in some cases by drivers. Tickets should be perforated in the vehicle. There are also season travel cards for one day, one week or one month. The price of the ticket for public transport is 1.00 Lv. (about 0.50 Euro).

Taxi: There are many taxis in Ruse, provided mostly by private firms. Information about the firm and charge rates (day and night) can be seen on stickers on the front or rear windows of the car. Charge rates for 1 kilometre are between 0.70 and 0.90 Lv. (about 0.35–0.45 Euro).

Money Exchange: Popular currencies in Bulgaria are the USD and EURO. Open hours of the banks are usually between 9.00 a.m. and 4.00 p.m. There are also a lot of foreign exchange offices.

Food Stores. Restaurants: All food stores work usually till 7.00 or 8.00 p.m., but there are also 24-hour open stores and stores that work on Saturdays and Sundays. Most foodstuffs, vegetables and fruit are sold at prices, similar to those in Western Europe. Restaurants offer highly varied prices depending on their category. In some small and inexpensive restaurants the price of a meal is about 10 Euro.

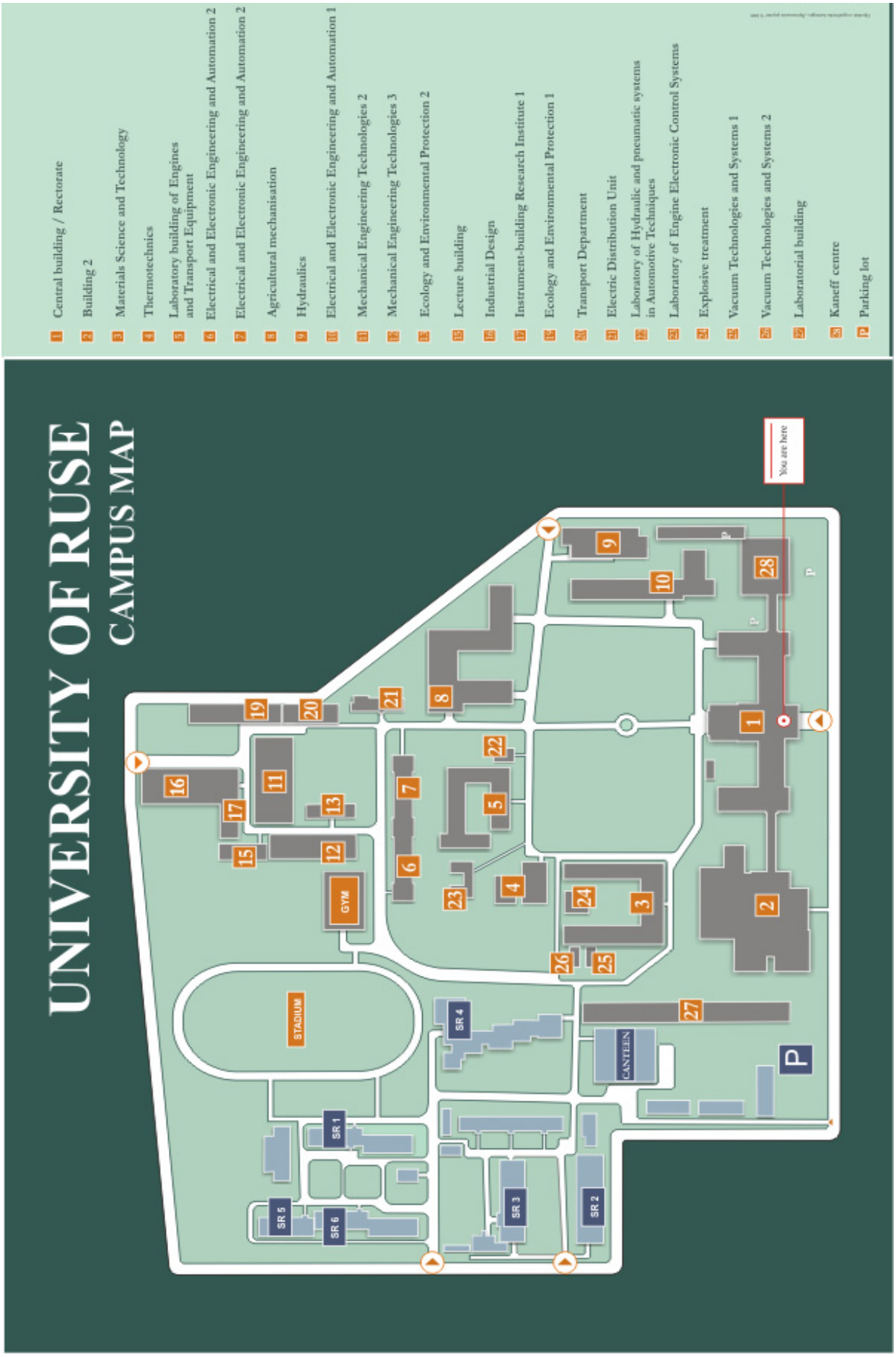
Phone Services: There are 3 large mobile network operators on the territory of Bulgaria and these are A1, Telenor and Vivacom. Pre-paid cards are available at the offices of the mobile operators. For international calls you may also use the services of the national post offices.

Bookshops and Photocopying Services: Copy services, books, textbooks, manuals and other training aids are offered in the University bookshop and stationery shop.

Student Organisations

The Student Council is a body which protects the interests of the students. It is elected by full-time bachelor, master and doctoral students and includes student representatives in the General Assembly of the University. The Student Council at the University of Ruse maintains an information centre, located on the first floor of the Central Building.

Campus Map of the University of Ruse



INFORMATION ON THE FACULTY OF ELECTRICAL ENGINEERING, ELECTRONICS AND AUTOMATION

The Faculty

of Electrical Engineering, Electronics and Automation

(Faculty of EEEA)

Study of electrical engineering subjects at the University of Ruse began in 1954.

The degree course of *Electrification of Agriculture* was initiated by a Decree of the Council of Ministers, No 208/21.05.1966., and in 1974 the Faculty of Electrical Engineering and Electrification of Agriculture with new degree courses – *Electrical Power Engineering*, *Automation of Production* and *Computational Machines* was established. The rapid development of advanced technologies in the field of electrical engineering and electronic industries required the reorganization of the faculty in 1984 into a **Faculty of Electrical Engineering, Electronics and Automation** and it became **the largest educational unit of the University**.

Over the last years about 900 full-time and part-time students have been trained at the FEEEA annually. 44 highly qualified lecturers are involved in the teaching, including 8 Prof.s, 20 Associate Prof.s, 3 Doctors of Science, 44 Doctors of Engineering and 30 PhD students. 5 technical staff are actively engaged in supporting the teaching activities.

Every year, an average of 30 students undergo training within ERASMUS+ and other international programmes, initiated and managed by lecturers from the Faculty. **More than 220 Bilateral agreements have been signed with universities from a number of countries in Europe, Asia, America and Africa** such as Algeria, Brazil, Great Britain, Germany, France, Portugal, Denmark, Sweden, Finland, Italy, Belgium, Netherlands, Austria, Greece, China, Malaysia, Indonesia, Jordan, Morocco, Egypt and many others. **In the 2024/25 academic year the faculty of EEEA trained 113 Erasmus students from Algeria, Brazil, Vietnam, Georgia, Egypt, Spain, Jordan, Cyprus, Kyrgyzstan, China, Malaysia, Morocco, Romania, Serbia, Thailand, Tunisia, Turkey, Uzbekistan, France.**

The faculty is the initiator and coordinator of four thematic networks under the ERASMUS program, in which more than 70 universities and companies from 35 European countries participated, as well as the 4-year Eurasian project, the goal of which is the Modernization of the higher education in Central Asia through new technologies.

The teaching of foreign undergraduate and PhD students is a characteristic feature of FEEEA activities. Since the establishment of the Faculty, 70 foreign students from 16 countries have been trained and 3 Doctoral theses have been defended by foreign citizens.

There are 4 departments that operate within the Faculty – 'Electrical Power Engineering', 'Automatics and Electronics', 'Computer Systems and Technologies' and 'Telecommunications'. The governing bodies of the Faculty are the Faculty Assembly, the Faculty and Dean's Councils, and the departments are managed by Departmental Councils and the Heads of Departments.

The good quality of the knowledge taught to the students is aided by modern laboratory facilities and the cooperation with a number of companies, such as Siemens, Johnson Controls, Schneider Electric, MOELLER company, etc., which helped to set up a fully-equipped electrical laboratory and computer rooms for free access and teaching purposes. Undergraduate and PhD students are given unlimited INTERNET access and the respective online services.

ФАКУЛТЕТ
"ЕЛЕКТРОТЕХНИКА, ЕЛЕКТРОНИКА И АВТОМАТИКА"
СТУДЕНТИ С ОТЛИЧЕН УСПЕХ
1-ви курс
Константин Теодоров Дочев, спец. КУА
Ивайло Миленов Димитров, спец. КСТ
Диан Лъчезаров Лазаров, спец. КСТ
Нурай Хабиб Салим, спец. КСТ
Даниел Ивелинов Панайотов, спец. КСТ
Мариян Владимиров Луков, спец. КСТ
Даниел Венциславов Василев, спец. КСТ
2-ри курс
Месру Зия Фикрет, спец. КСТ
Преслав Иванов Стоянов, спец. КСТ
Деян Николаев Събев, спец. КСТ
Пламен Станиславов Христов, спец. КСТ
Александър Светославов Димитров, спец. КУА
Йордан Миленов Йорданов, спец. КСТ

ФАКУЛТЕТ
"ЕЛЕКТРОТЕХНИКА, ЕЛЕКТРОНИКА И АВТОМАТИКА"
Студентска научна сесия, секция „Електротехника, електроника и автоматика"
за успешно представяне
Али Гюрсел Хякъъ, 3-ти курс, EEEO
Yelizaveta Deryabina
Gabriel Martin Martinez
Beiu Armand-Constanin
Arhire Filip-Marian
Валентин Пламенов Христов, 2-ри курс, EEEO
Negrea Andrei-Alexandru
Păuna George-Viorel
Chiriac Andrei-Rareş
Manea Simon-George

University of Rousse
上海第二工业大学 保加利亚鲁塞大学
签 约 仪 式
Signing Ceremony
Shanghai Polytechnic University, China
University of Ruse, Bulgaria
2018.10.30

University of Rousse
上海第二工业大学 保加利亚鲁塞大学
仪 式

РУСЕНСКИ УНИВЕРСИТЕТ ·АНГЕЛ КЪНЧЕВ·
ESN

Testing Specified Program
System by Finite State Machines

PLANSOM
Money Management System
Software Engineering Project 2023

FEEEA has long standing traditions in the field of research and abundant experience in using the research results in teaching, in involving students in the scientific problems that lecturers investigate, in selection and training of future teaching and research staff.

Major scientific fields are:

- Electrical Power Engineering
- Renewable and Alternative Energy Sources
- Energy Efficiency
- Product quality control through computer vision, spectral analysis and hyperspectral analysis
- Industrial Automation
- Control Theory
- Electronification of industry and medicine
- Micro- and Nanoelectronics
- Distributed Data Processing Systems
- Artificial Intelligence
- Innovative Educational Technologies
- Computer Telecommunications Systems
- Virtual Reality and Multimodal Human-Machine Interfaces
- Computer and Communication Network and Systems
- Embedded Systems and robotized platforms
- Signal processing
- Monitoring and automation of processes
- Modelling and simulation

Dean

Assoc. Prof. Vyara Ruseva, MEng, PhD

Tel.: +359 82 888 665, +359 82 888 616

E-mail: vruseva@uni-ruse.bg

Vice Dean of Student Affairs

Assoc. Prof. Anka Krasteva, MEng, PhD

Tel.: +359 82 888 665, +359 82 888 301

E-mail: akrasteva@uni-ruse.bg

Vice Dean of Research Affairs

Assoc. Prof. Yordan Kalmukov, MEng, PhD

Tel.: +359 82 888 665, +359 82 888 681

E-mail: jkalmukov@uni-ruse.bg

Expert of International Affairs

Assoc. Prof. Emeritus Stoyanka Smrikarova

Tel.: +359 82 888 665, +359 82 888 743

E-mail: ssmrikarova@ecs.uni-ruse.bg

ECTS & ERASMUS Coordinators

Faculty ECTS Coordinator
Assoc. Prof. Anka Krasteva, MEng, PhD
tel.: +359 82 888 665, +359 82 888 301
E-mail: akrasteva@uni-ruse.bg

Faculty ERASMUS Coordinator
Assoc. Prof. Emeritus Stoyanka Smrikarova, MEng
tel.: +359 82 888 665, +359 82 888 743
E-mail: ssmrikarova@ecs.uni-ruse.bg

Departmental ECTS Coordinators:

Department of Electrical Power Engineering
Assoc. Prof. Ognyan Dinolov, MEng, PhD
tel.: + 359 82 888 330, E-mail: odinolov@uni-ruse.bg

Department of Automatics and Electronics
Assistant Prof. Yavor Neykov, MEng, PhD
tel.: + 359 82 888 772, E-mail: yneikov@uni-ruse.bg

Department of Computer Systems and Technologies
Assoc. Prof. Emiliya Golemanova, MEng, PhD
tel.: + 359 82 888 681, E-mail: egolemanova@ecs.uni-ruse.bg

Department of Telecommunications
Assoc. Prof. Adriana Borodzhieva, MEng, PhD
tel.: + 359 82 888 734, E-mail: aborodzhieva@uni-ruse.bg

Departmental ERASMUS Coordinators:

Department of Electrical Power Engineering
Assoc. Prof. Ognyan Dinolov, MEng, PhD
tel.: + 359 82 888 330, E-mail: odinolov@uni-ruse.bg

Department of Automatics and Electronics
Assoc. Prof. Seher Kadirova, MEng, PhD
tel.: + 359 82 888 741, E-mail: skadirova@uni-ruse.bg

Department of Computer Systems and Technologies
Assoc. Prof. Georgi Georgiev, MEng, PhD
tel.: + 359 82 888 744, E-mail: gtgeorgiev@uni-ruse.bg

Department of Telecommunications
Prof. Plamen Zahariev, MEng, PhD
tel.: + 359 82 888 663, E-mail: pzahariev@uni-ruse.bg

DEPARTMENTS IN THE FACULTY OF ELECTRICAL ENGINEERING, ELECTRONICS AND AUTOMATION

DEPARTMENT OF ELECTRICAL POWER ENGINEERING

BUSINESS CARD of the Department

Head of Department

Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD

Tel.: +359 82 888 455, +359 82 888 302

E-mail: opetrov@uni-ruse.bg

https://www.uni-ruse.bg/departments/ESEO

The **Department of Electrical Power Engineering** was established in December, 1973.

One full Professor, 6 Associate Professors and an administrative secretary work in the Department of Electrical Power Engineering. They have trained and prepared over 2000 qualified electrical engineers who work in Bulgaria and other countries. The department has 12 integrate laboratories.

The department is accredited to teach students in Bachelor's and Master's and PhD Degrees.

The curricula correspond to those in Western universities and meet the current requirements for higher education. Students acquire knowledge in the field of the electric-power production, distribution and consumption in the public and private sectors, as well as knowledge on energy management, electronics and computer systems. Professional collaboration with leading companies like Schneider Electric, Siemens, ABB, Danfoss, Electrodistribution North AD, Kozloduy NPP, National Electricity Company (NEC), TPP-Ruse, ELSTART Ltd. and others is continuously provided by which the laboratory base of the specialty develops.

Students can specialize in three main directions:

1. Electrical power engineering and electrical equipment in industry;
2. Electrical power engineering and electrical equipment in agriculture and food industry;
3. Renewable and Alternative Energy Sources.

The department develops intense international cooperation within the frameworks of the programs Erasmus+ and others through which students can place twice a part of their training in various European universities.

PhD students in the scientific fields *Electrical Power Engineering and Electrical Equipment* and *Mechanization and Electrification of Agriculture* are trained in the department. Over 45 PhD students, including students from Vietnam, Bangladesh, Morocco, Syria and Yemen, have been instructed.

A team from the department won first prize at the World Exhibition of Inventions and Innovation EXPO'91.

The following key results are achieved:

- Bilateral agreements for exchange of students and teachers within the ERASMUS program with universities in England, Austria, Belgium, Denmark, Sweden, Germany, Greece and others are signed. The department is constantly expanding the scope of this cooperation involving new Western universities.
- Advanced equipment is delivered. A contract is signed and a training center for low voltage switchgear and protective equipment is created in cooperation with Schneider Electric Bulgaria Ltd. The company periodically renovates the lab with new and modern laboratory equipment.
- Computer rooms for under- and post-graduate students are equipped with modern computers connected with the local University network, which is a part of the global network *Internet* and enables the exchange of information with organizations and people from all over the world.

The Department of Electrical Power Engineering publishes textbooks and WEB based tools that assist in the training of students from the specialty *Electrical Power Engineering and Electrical Equipment*.

During the period from 2010 to 2024 the teachers from the Department of Electrical Power Engineering have published:

- 583 scientific publications at home and abroad as the teachers have participated with over 170 reports at international scientific conferences in Bulgaria and with over 100 reports at international conferences abroad;
- 10 schoolbooks and 23 textbooks on paper and in digital format.

The number of publications involving undergraduate and postgraduate students is over 90 in Bulgaria and over 20 abroad.

DEPARTMENT OF AUTOMATICS AND ELECTRONICS

BUSINESS CARD of the Department

Head of Department

Assoc. Prof. Tsvetelina Dimitrova Georgieva, MEng, PhD

Tel.: +359 82 888 668

E-mail: cgeorgieva@uni-ruse.bg

https://www.uni-ruse.bg/Faculties/FEEA/AE/

The Department of Automatics and Electronics is a newly established department in the structure of the Faculty of Electrical Engineering, Electronics and Automation after a decision of the Academic Council on 02.07.2024. It unites the existing departments of "Automatics and Mechatronics" and "Electronics".

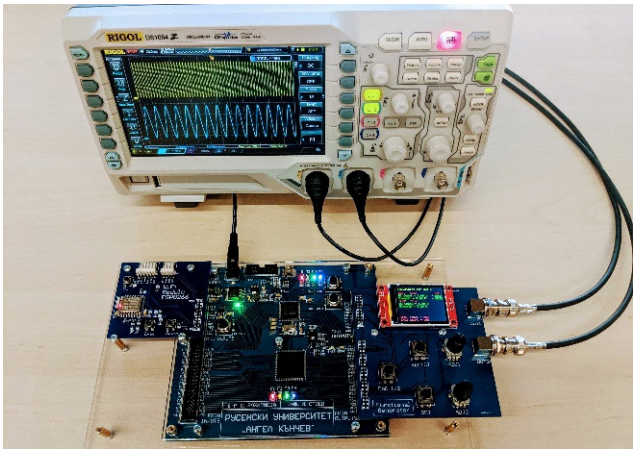
The department employs 2 professors, 5 associate professors and 5 senior assistants, an administrative secretary. Two lecturers have a scientific degree of Doctor of Sciences and all the others have a scientific and educational degree of Doctor.

The lecturers of the department are constantly improving their qualifications and improving their knowledge through participation in specialized seminars and specializations at leading European and world universities. Such opportunities are also provided to students of the specialty "Electronics" and "AMC" under the Erasmus+ programme and others.

The University of Ruse is accredited by the National Agency for Assessment and Accreditation to train students in the educational and qualification degrees of Bachelor in "Electronics" and "Computer Control and Automation", Master in "Electronics", "Automotive Electronics", "Automatics and Computer Systems for Automation", "Automatics and Mechatronics" and in the scientific and educational degree of Doctor in "Electronization" and "Production Automation".

The research activity of the department is in the following areas: artificial intelligence; computer vision; spectral analysis; image recognition; sensor technology; robust control; electromechanical devices and systems; automated electric drive; automation of technological processes; wireless sensor networks in precision agriculture; electronization; automotive electronics; medical electronics; microelectronics; electronic control and management systems; applied electronics in agriculture and industry; automated design in electronics; electronic security systems.

The Department of Automatics and Electronics actively participates in international and national scientific and educational programs, constantly improving its material base.
The teaching laboratories are equipped with modern measuring equipment, computer and presentation equipment, a large part of which is donated by leading companies in the sector.
Modern computer rooms are available to students at the department.
The department operates a "Student Research Laboratory in Electronics" and a PC "Industrial Internet of Things", where each student is given the opportunity to develop and research electronic devices, work on projects and participate in scientific conferences and exhibitions.



➢ Graduate engineers are successfully implemented in various enterprises and companies in the sector in our country and abroad. The curricula and programs for bachelors and masters in the specialty "Electronics" comply with the Regulation of the Council of Ministers on the uniform state requirements for acquiring higher education in the specialty "Electronics". They are harmonized with similar majors in EU countries, which ensures recognition of diplomas and student mobility based on ECTS credits.

➢ Engineers majoring in "Computer Control and Automation" receive in-depth knowledge and acquire a wide range of professional skills in the field of automation, mechatronics, computer, information and control systems and technologies, which enable them to successfully implement themselves in various branches of industry, energy, communications, transport, agriculture, as well as in various engineering, research and scientific units.

➢ Bilateral agreements for the exchange of students and lecturers within the framework of the Erasmus+ program have been signed with universities from the Czech Republic, Slovakia, Slovenia, Croatia, Romania, Poland, Turkey, Greece, Azerbaijan, Morocco and Canada.

➢ The lecturers of the department publish monographs, studies, books, textbooks and teaching aids to provide the educational process with modern scientific and educational literature.

DEPARTMENT OF COMPUTER SYSTEMS AND TECHNOLOGIES

BUSINESS CARD of the Department

Head of Department

Prof. Tsvetozar Stefanov Georgiev, MEng, PhD

Tel.: +359 82 888 711, +359 82 888 748

E-mail: TGeorgiev@ecs.uni-ruse.bg

https://www.uni-ruse.bg/departments/KST

The degree course is accredited by the National Agency for Evaluation and Accreditation. The curriculum which students follow was devised after a year's study of the experience of different universities in Europe, America and Japan and with the participation of leading specialists from the Bulgarian Academy of Sciences as well as from all departments of Computer Systems and Technologies in the country. Students are trained in two degree courses - Bachelor and Master and are awarded the professional qualification of Computer Engineer.

A degree course in Information and Communication Technologies is being prepared in collaboration with the Department of Telecommunications.

The department offers accredited PhD courses "Automation in Non-material Areas" and “Automated Data Processing and Control Systems”.

The Department is currently carrying out active research in the following major fields:

- Distributed Data Processing Systems
- Innovative Educational Technologies
- Computer Telecommunication Systems
- Automated Systems for Information Management and Control
- Virtual Reality and Multimodal Human-Machine Interfaces

The following major results have been achieved:

- **The Department has 11 training and 3 research laboratories,** equipped with state-of-the-art computer equipment. The training of students is conducted in these advanced state-of-the-art multifunctional and interdisciplinary teaching and research laboratories, equipped with the support of leading computer companies.
- Thanks to the **71 bilateral agreements** for exchange of students and staff under the ERASMUS+ programme with prestigious universities and companies from 24 countries in Europe and **38 bilateral agreements** with universities from 18 countries in Asia, a number of the best students are sent annually for a semester abroad to study or develop their diploma theses.
- **In 2019, a training contract was signed between the University of Ruse "Angel Kanchev" and the Shanghai Polytechnic University (China)** in order to obtain a double diploma in computer engineering from students from both countries.
- **The Department is the initiator and coordinator of four large-scale European projects** – thematic networks, including more than 70 universities from 35 countries.
- The Department is the main organizer of the prestigious international scientific conference **CompSysTech.**
- **The Department actively participates** in national and international scientific and educational projects within the 7-th Framework Programme, Erasmus+, etc.

In conclusion, it has to be noted that in the course of its existence, the **Department of Computer Systems and Technologies** has proved its ability to react adequately to the challenges of the times in which we live. The department crossed the threshold of the twenty first century fully prepared to integrate into the common European higher education area.

DEPARTMENT OF TELECOMMUNICATIONS

BUSINESS CARD of the Department

Head of Department

Prof. Plamen Zlatkov Zahariev, MEng, PhD

Tel.: +359 82 888 663, +359 82 888 841

E-mail: pzahariev@uni-ruse.bg

https://www.uni-ruse.bg/departments/Telekomunikatsii

The **Department of Telecommunications** was established in 2001 on the recommendation of the Accreditation Commission. The department is a successor of the "Telecommunication Systems and Technologies" scientific, research and education group at the department of "Electronics". In April 2011 the Department was renamed to **Department of Telecommunications**.

Staff:

- 9 lecturers including 3 Professors PhD, 2 Associate Professors PhD and 4 Principal Lecturers PhD;
- 1 Administrative staff member;
- 7 PhD students.

Teaching activities:

The Department of Telecommunications is responsible for the full-time and part-time training of students in the Bachelor degree programs in "Internet and Mobile Communications" and "Information and Communication Technologies" (joint with the Department of Computer Systems and Technologies), for the Master degree program in "Internet and Multimedia Communications" and for the PhD programs in "Communication networks and systems" and "Theoretical foundations of the communication systems". The development of the curricula, the learning plans and the courses in the Department of Telecommunications are based on the experience that was gained from leading European universities, which are in permanent cooperation with the staff of the department and are regularly exchanging students, PhD students and teachers with the department. The educational processes and the trainings of the students are conducted by qualified teachers who continuously improve their qualifications both in Bulgaria and in European universities under international programs.

Research activities:

The academic staff, the PhD students and the undergraduates do research in the following fields:

- Telecommunication and computer networks and systems;
- Wireless and radio technologies for data transfer;
- 3D technologies for digitalization and visualization;
- Digital processing and transmission of signals;
- Software defined networks and cloud technologies and services;
- Embedded systems, robotic platforms and Unmanned Aerial Vehicles;
- Artificial Intelligence, Computer vision and neural networks;
- Network and information security and cybersecurity.

The lecturers work on national and international scientific projects and have contracts with companies. The scientific production of the members of the Department has been published in local and international conference proceedings and journals.

The department is an institutional member of the International Federation of Automatic Control **/IFAC/** and the Automation and Information Union. Some of the academic staff are regular members of IEEE, ACM, the European Association for Education in Electrical and Information Engineering (EAEEIE) and the Union of Scientists – Ruse. The Department has good co-operation with leading companies working in the telecommunication field in Bulgaria – Cisco Systems Bulgaria, Huawei Technologies Bulgaria, VMware / Broadcom Bulgaria, Siemens Bulgaria, Yettel, Vivacom, A1, Teracom, Stemo, NRJ Soft, Kontrax, etc. Joint seminars and presentations of modern telecommunication systems and technologies are organized periodically.

Department Facilities:

The technical equipment of the department has been completely renewed and modernized with the help of externally funded projects, donations and departmental income from teaching services and research. In the last two years, five new multifunctional and interdisciplinary teaching and research laboratories have been established and equipped with new equipment. All teaching laboratories and offices of the department are equipped with modern computer, laboratory-measuring and office equipment

The specialized equipment in the laboratories of the department is produced by the world-leading telecommunications companies, including Cisco, MikroTik, Dell, HP, SuperMicro, VMware, Acer, Yokogawa, Agilent, Siemens, etc. The department is having its own high speed Internet access network and various licensed software products for the teaching and research activities are provided to all students and staff members. Numerous WEB-based applications, textbooks and lecture notes were developed and are available to the students. The aspiring students in the department have the opportunity to complete the Cisco and MikroTik networking academies and to obtain internationally recognized industry certificates.

International Co-operation and European integration:

Lecturers from the department are actively involved in various international and national projects under programs, such as OP SESG, Erasmus+, Interreg Bulgaria-Romania, Interreg Danube Transnational Programme, etc.

The Department of Telecommunications has signed bilateral agreements under the Erasmus+ program with universities from Germany, France, Belgium, Sweden, Turkey, Denmark, Portugal, Spain, Italy, Norway, Great Britain, Romania, Malaysia, Indonesia, Laos, Thailand, Cambodia, Jordan, Palestine, Brazil, etc. Annual short-term and long-term exchange mobilities of students, doctoral students and teachers are carried out under these agreements.

UNDERGRADUATE PROGRAMS

UNDERGRADUATE STUDIES IN ELECTRICAL POWER ENGINEERING

PROFESSIONAL STANDARDS OF A BACHELOR IN

ELECTRICAL POWER ENGINEERING

Degree course: **Electrical Power Engineering**
Degree awarded: **BEng**
Professional Qualification: **Electrical Engineer**
Duration: **4 years**

The main goal of the **Electrical Power Engineering** Bachelor degree is to prepare electrical engineers with a wide profile of engineering knowledge and professional skills, who can find jobs in all the spheres of generation, transmission, distribution and effective use of electrical and other types of power.

The quality of training of students doing the Electrical Power Engineering Bachelor degree is assured through:

- The use of modern laboratories and computer facilities;
- The availability of highly qualified academic staff;
- The subjects included in the curriculum which fall into the following categories:
  - ***fundamental subjects*:** Mathematics, Physics, Technical Documentation, Programming, Theory of Electrical Engineering, Electrical Measurements, Mechanics, Machine Elements, Hydraulics, Heat Engineering, Electronics and Microprocessor Engineering, Automation, Foreign Languages, Economics and some others.
  - ***general specialist subjects:*** Electrical Machines and Apparatuses, Electrical Networks and Systems, Short Cut Currents, High Voltage Technics, Automated Electrical Motion, Electrical Part of Electrical Power Plants and Electrical Power Stations, Relay Defence, Power Supply, Electrical Equipment, Power Engineering, Installation and Lighting Engineering, Management in Electrical Power Engineering, Exploitation of Electrical Devices and some others.
  - ***highly specialised subjects*:** in the last semester the students choose four subjects in either of the three specialist profiles: *Electrical Power Supply and Equipment in Industry*; *Electrical Power Supply and Equipment in Agriculture and Food-processing Industry* and *Renewable energy resources.*

The engineer that has graduated in Electrical Power Engineering has to possess the following **knowledge and skills:** to design all types of electrical installations, circuits, devices, facilities and units; to mount, operate, repair and test electrical machines and apparatuses, cable and power lines, electrical power stations and transformers, electrical panels, power and lighting installations, and other electrical devices and equipment in industry, agriculture, public sector and everyday life; to organise and manage the power plants and departments in enterprises; to do research and design; to evaluate the economic and power efficiency in the generation, transmission and the use of electrical power; to deal with marketing and sales in the field of electrical power engineering, electrical equipment and all electrical devices and electrical equipment tools.

A Bachelor of Electrical Power Engineering **can work as** an expert or manager in: all enterprises in the field of electrical power engineering (National Electric Company, generation, transmission and distribution companies); the power departments of industrial, agricultural, transport, construction and other enterprises; designer units; specialised electrical laboratories; and research units and training centres.

CURRICULUM
of the degree course in
ELECTRICAL POWER ENGINEERING

First Year

Code	*First term*	*ECTS*	*Code*	*Second term*	*ECTS*
S02519	Mathematics 1	7	S00846	Higher Mathematics 2	6
S02521	Physics 1	6	S01022	Physics 2	4
S02520	Programming and Computer Applications 1	4	S01045	Programming and Computer Applications 2	5
S00592	Teaching Practice	3	SB15438	Theory of Electrical Engineering 1	6
S00133	Electrical Safety	2	S00411	Electrical Materials Science	5
S02522	Technical Documentation	5			
S00366	Computer Graphics				
	Foreign Language:	3		**Foreign Language:**	4
S00424	English 1		S03257	English 2	
S00523	German 1		S03258	German 2	
S00683	French 1		S03290	French 2	
S00760	Russian 1		S03294	Russian 2	
	Total for the term:	***30***		***Total for the term:***	***30***

Second Year

Code	*Third term*	*ECTS*	*Code*	*Fourth term*	*ECTS*
S03035	Mathematics 3	4	S03231	Electrical Machines 1	7
SB15439	Theory of Electrical Engineering 2	5	S03232	Electrical Networks and Systems	6
SB15440	Electrical Measurements	5	S03233	Electrical Networks and Systems - Course Project	4
S03229	Electronics and Microprocessor Systems	6	S00755	Short Circuits	5
S03147	Technical Mechanics	5	S03234	Electrotechnical drawing (AutoCAD)	3
S03230	Fundamentals of Automation	5	S03235	High Voltage Technique	5
	Total for the term:	***30***		***Total for the term:***	***30***

Third Year

Code	*Fifth term*	*ECTS*	*Code*	*Sixth term*	*ECTS*
S03236	Electrical Machines 2	6	S03241	Electrical Power Equipment	6
S03237	Electrical Apparatuses	5	S03242	Electrical Power Equipment - Course Project	4
S03238	Electric Power Stations and Substations Engineering	7	S03243	Lighting and Installation Equipment	7
S03239	Electric Power Stations and Substations Engineering - Course Project	4	S03244	Electrical Transport	6
S03240	Electrical Drive	5	S03245	Economics	3
SB10643	Machine Elements and Mechanisms	3	S03246	Heat Energy	4
	Total for the term:	***30***		***Total for the term:***	***30***

Fourth Year

Code	*Seventh term*	*ECTS*	*Code*	*Eighth term*	*ECTS*
SB10646	Electrical Power Supply	8	SB10652	Management of Electrical Engineering	4
SO3249	Power Supply - Course Project	4		**Group A**	
SO3250	Protective Relaying	6	SB10653	Technical Exploitation of Electrical Equipment in Industry	4
SB10647	Renewable Energy Resources and Energy Technologies	8	SB10654	Industrial Enterprises Electric Equipment	5
SB10648	Hydraulic Machines and Pneumatics	4	SB10655	Lighting Equipment	3
			S03254	Self Preparing for thesis	4
			S03267	Thesis defence	10
	Total for the term:	***30***		***Total for the term:***	***30***

Code	*Eighth term*	*ECTS*
SB10652	Management of Electrical Engineering	4
	Group B	
SB10656	Technical Exploitation of Electrical Equipment in Agriculture and Food Industry	4
SB10657	Agricultural and Food Industry Electric Equipment	5
SB10658	Electronic Devices and Systems in Agriculture and Food Industry	3
S03254	Self Preparing for thesis	4
S03267	Thesis defence	10
	Total for the term:	***30***

Code	*Eighth term*	*ECTS*
SB10652	Management of Electrical Engineering	4
	Group C	
SB10659	Technical Exploitation of Renewable Energy Resources	4
SB10660	Solar Energy Installation and Power Farm	5
SB10661	Wind and Hydropower Plant Parks	3
S03254	Self Preparing for thesis	4
S03267	Thesis defence	10
	Total for the term:	***30***

Total for the course of study: 240 ECTS credits

S02519 Mathematics - 1

ECTS credits: 7 **Weekly classes:** 2lec + 2sem + 0labs + 0ps + ca
Assessment: exam **Type of exam:** written
Departments involved:
Department of Mathematics
Faculty of Natural Sciences and Education
Lecturers:
Assoc. Prof. Yuriy Dimitrov Kandilarov, PhD, Dept. of Mathematics, tel. +359 82 888 634,
E-mail: ukandilarov@uni-ruse.bg
Pr. Assist. Anna Simeonova Lecheva, PhD, Dept. of Mathematics, phone tel. +359 82 888 453,
E-mail: alecheva@uni-ruse.bg
Abstract:
HIGHER MATHEMATICS 1 is fundamental to engineering education and builds on the studies of Mathematics from secondary education. It is imperative to the students' education in other mathematical subjects as well as in Physics, Mechanics, Electrical engineering and a number of general engineering subjects. The course includes topics from Linear algebra and analytical geometry, Differential and integral calculus of function of a variable.
Course content:
Linear algebra – matrices, determinants, system of linear equations; Vector algebra – vector operations; Plane analytical geometry – line in plane; Differential calculus of function of a variable - derivative of function and applications; Integral calculus – basic integration techniques, integration of rational functions.
Teaching and assessment:
The students get acquainted via lectures with basic mathematical notions. By rule, the theorems do not include proofs but there are many examples and applications given. The seminars develop the students' technical ability for practical problem solving. Students are allowed to use formulas during classes, tests and exam. Students should prepare for the seminars by learning the course material and examples. The exam is considered passed only if the student has solved at least two problems. One of those problems should be chosen from the Linear algebra, Vector algebra and Analytical geometry sections. The other one should be chosen from the Differential and integral calculus of a function of a variable. The final mark is formed after a talk with the student..

S02521 Physics - 1

ECTS credits: 6 **Weekly classes:** 2lec + 0sem + 2labs + 0ps + p
Assessment: exam **Type of exam:** written
Departments involved:
Department of Science, Machine Elements, Engineering Graphics and Physics (MSMEEGPh)
Faculty of Transport
Lecturers:
Assoc. Prof. Petko Hristov Mashkov, MEng, PhD, Dept. of MMEEG and Physics, tel.: +359 82 888 583,
E-mail: pmashkov@uni-ruse.bg
Assoc. Prof. Vladimir Mateev Mateev, MEng, PhD, Dept. of MMEEG and Physics, tel.: +359 82 888 583,
E-mail: vmateev@uni-ruse.bg
Abstract:
The course aim is to introduce students to the physical character of processes and phenomena in nature and the methods of their investigation, with the most general properties of the matter and material objects. The laboratory exercises aim at creating skills for experimental investigation of physical phenomena.
Course content:
Measuring physical quantities. Mechanics of material point. Gravitation. Work and energy. Laws of conservation in mechanics. Oscillations & waves. Acoustics. Molecular physics and thermodynamics. Electric field and electric current. Magnetic field and magnetic forces.
Teaching and assessment:
Lectures give the main theoretical material, supported by some experimental and multimedia demonstrations of physical phenomena and processes. At the laboratory sessions the students work experimentally and investigate particular physical phenomena. During term students prepare a scholarly essay. Student knowledge of the theoretical material is tested regularly. The exam is in a form of test. The end mark depends on the results of the test, of the laboratory sessions and of the scholarly essay.

S02520 Programming and Computer Applications - 1

ECTS credits: 4 **Weekly classes:** 2lec + 0sem + 0labs + 1ps
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Informatics and Information Technologies
Faculty of Natural Sciences and Education
Lecturers:
Prof. Tzvetomir Ivanov Vassilev, MEng, PhD, Dept. of Informatics and Information Technologies,
tel. +359 82 888 475, E-mail: tvassilev@uni-ruse.bg
Principal Assistant Metody Lyubchev Dimitrov, MEng, PhD, Dept. of Informatics and Information Technologies, tel. +359 82 888 470, E-mail: mdimitrov@ami.uni-ruse.bg
Abstract:
The first part of the course aims at giving knowledge about the computer as a technical tool and the software products which make it a priceless assistant to specialists in all fields. The second part is an introduction to programming and aims at giving students skills to develop algorithms and computer programmes with intermediate level of difficulty. Significant attention is paid to algorithm development. The C++ programming language is used as a tool, which is widely spread and also used in later courses.
Course content:
A brief history of computers. Classification. CPU, main memory. Secondary storage. Input-Output devices. Computer networks. Operating systems. Word-processing, Spreadsheets and Databases. Algorithms. Introduction to C++. General structure of a program. Operations. Built-in functions. Expressions. Branches.
Teaching and assessment:
The lectures are 2 hours per week. The workshops take place in computer labs and the students work on the above topics under the lecturer's supervision. At the end of each stage the practical skills of the students are tested.
Students' knowledge on the first part of the course is examined using a computer test of 50 questions. Students also do a control work on the second part of the lecture material.
The final grade is determined from the test mark, the continuous assessment at the workshops and the mark of the control work.

S00592 Teaching Practice

ECTS credits: 3 **Weekly classes**: 1lec + 0sem + 0labs + 2ps
Assessment: colloquium **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Anka Hristova Krasteva, MEng, PhD, Dept. of Electrical Power Engineering,
tel.: + 359 82 888 301, E-mail: akrasteva@uni-ruse.bg
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD, Dept. of Electrical Power Engineering,
tel.:+359 82 888 661 E-mail: kkoev@uni-ruse.bg
Abstract:
The course objective is for the students to receive knowledge and skills, which they will use in the electrical practice. The input link is the knowledge, obtained from the high school and the output links are the electrical courses, studied in the Bachelor 's degree program.
Course content:
Basic elements in electrical circuits, ways of connection. Notation of elements in electrical circuits. Types of electric measuring devices, measuring units, measurement errors. Basic elements in the systems for automatic control. Technologies for producing printed circuit boards. CAD/CAM systems. Architecture and programming of programmable logic controllers. Electrical machines. Electrical Drive and Supply of Aggregates.
Teaching and assessment:
The lecture topics are assimilated better by using a multimedia projector and laptop.The necessary equipment allows every student independently to get acquainted with the electrical equipment. Oral examining is done during the lectures and workshops. The colloquium is written and oral.

S00133 Electrical Safety

ECTS credits: 2 **Weekly classes**: 1lec + 0sem + 0labs + 1ps
Assessment: colloquium **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering,
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Ivaylo Stefanov Stoyanov, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 843,
E-mail: stoyanov@uni-ruse.bg
Abstract:
The course Electrical Safety is designed for the students studying in the Bachelor of Science courses in Electrical engineering, Electronics and Automation and Computer Control. It gives the students with knowledge and skills regarding the basic principles, methods and technical means of providing of electrical safety when working with electrical devices, appliances and installations. The taught material is being supplemented with examples and cases from the industry which helps the students gain the ability to make decisions.
The course is connected with other disciplines - Theoretical Electrical Engineering, Electrical Measurements and Electrical materials science as well with the Industrial practice and the future professional perspectives of the students.
Course content:
Influences alternative and direct current of people. Electrostatics and methods for safety. Electrostatic sources. Electromagnetic compatibility of the devices. Climate and mechanical resistance to cold, dry heat, temperature changes, sudden temperature changes, corrosion atmosphere, vibrations, noise, changes of the air pressure, sun radiation, contaminating fluids and their combinations. Fire safety and explosion-proof safety in the electric equipment's. Influence noise and vibrations of electrical equipment. Electrical installations of buildings. Protection for safety. Protection against over voltages of atmospheric origin or due to switching.
Teaching and assessment:
The teaching is based on the usage of classical pedagogic forms. On some topics projecting materials and videos are shown. The practical exercises follow the lecture topics Early passing of exam is not allowed. At the exam the students work one question to estimate the degree of knowledge.

S00424 English 1, S00523 German 1, S00683 French 1, S00760 Russian 1

ECTS credits: 3 **Weekly classes:** 0lec + 0sem + 0labs + 3ps
Assessment: colloquium **Type of exam:** written/oral
Departments involved:
Department of Foreign Languages
Faculty of Mechanical and Manufacturing Engineering
Lecturers:
Snr Lec. Elitsa Georgieva, Dept. of Foreign Languages, tel.:+359 82 888 532, E-mail: edgeorgieva@uni-ruse.bg
Snr Lec. Diana Stefanova, Phd, Dept. of Foreign Languages, tel.:+359 82 888 532,
E-mail: dstefanova@uni-ruse.bg
Snr Lec. Sergey Bartenev, Dept. of Foreign Languages , tel.:+359 82 888 824, E-mail: sbartenev@uni-ruse.bg
Snr Lec. Iliyana Benina, Phd, Dept. of Foreign Languages, tel.:+359 82 888 815, E-mail: ibenina@uni-ruse.bg
Abstract:
The foreign language education as stipulated in this syllabus aims to build on the knowledge and skills the students have acquired in secondary school within the mandatory foreign language courses and to continue to develop their linguistic, sociolinguistic, pragmatic and intercultural competence, both in terms of everyday situations and those related to their course of study at the university. The program provides opportunities for integrated improvement and development of the four language skills - listening, speaking, reading, writing, as well as for expanding and developing the active vocabulary and grammatical competence on everyday and professional topics.
Course content:
The syllabus aims at the parallel development of the four language skills of reading, listening, speaking and writing within several main thematic areas: Education, Jobs and Careers, Engineering Sciences, Materials Science, The Environment and Environmental issues, and Intercultural Communication.
Teaching and assessment:
The lessons are taught through practical classes. The semester is validated if classes have been attended regularly and ends with a summative assessment expressed as a Pass/Fail mark.

S02522 Technical Documentation

ECTS credits: 5 **Weekly classes:** 1lec + 0sem + 0labs + 2ps + ca
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Machine Science, Machine Elements, Engineering Graphics and Physics (MSMEEGPh)
Faculty of Transport
Lecturers:
Assoc. Prof. Vyarka Toncheva Ronkova, MEng, PhD, Dept. of MSMEEGPh, tel.:+359 82 888 461
E-mail: vronkova@ uni-ruse.bg
Abstract:
The course "Technical documentation" teaches the methods for design, standard documents and rules for elaboration of design documents (drawings, schemes, textdocuments), notations when drawing specific parts of the electric industry, common assemblies in engineering, as well as the opportunities and tools for electronic documentation. At the workshops and while doing the course work the students acquire the skills of independent elaboration and comprehension of design documents per hand and with application of computer.
Course content:
Main characteristics and importance of the documentation of technical solutions. General requirements for the preparation of technical documents. Complexity of technical documentation. Part drawing. Assembly drawing. Text documents. Making drafts of items with electrical mounting, electrical schemes etc., rules for working out and reading. Symbols for expressing specific details from the electrical industry, Use of programming products for electrical drawings with application of computer.
Teaching and assessment:
The lectures present the theoretical material, that give main knowledge how to prepare technical documents. At the seminars students solve problems and prepare to participate in their course work under the guidance of the teacher. The course work is elaborated out of classes and is checked, corrected and marked by the lecturer. The final mark is formed from the results of the course work and two control works.

S00366 Computer Graphics

ECTS credits: 5 **Weekly classes:** 1lec + 0sem + 0labs + 2ps + ca
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Machine Science, Machine Elements, Engineering Graphics and Physics (MSMEEGPh)
Faculty of Transport
Lecturers:
Assoc. Prof. Vyarka Toncheva Ronkova, MEng, PhD, Dept. of MSMEEG, tel.:+359 82 888 461,
E-mail: vronkova@ uni-ruse.bg
Assoc. Prof. Krasimir Stankov Kamenov, MEng, PhD, Dept. of MSMEEG, tel.:+359 82 888 461
E-mail: kkamenov@ uni-ruse.bg
Abstract:
The course "Computer Graphics" has the objective to acquaint the students with the application of computer as a technical device and with the different kinds of application of programming products for special electrical drawing and schemes AutoCAD. At the workshops and while doing the course work the students acquire the skills of independent elaboration and comprehension of design documents with application of special programming products and computer.
Course content:
2-CAD Systems specifically programming products for electrical drawings. General requirements for the preparation of technical documents. Text documents, electrical schemes etc., rules for working out and reading. Complexity of the technical documentation. Symbols for expressing specific details from the electrical industry, Making draft symbols of electrical elements. Use of programming products for electrical drawings with application of computer.
Teaching and assessment:
The lectures present the theoretical material, that give main knowledge how to prepare technical documents with application of computer and special programming product for electrical drawings Microsoft Visio. At the workshops students solve problems and prepare to work on their course work. The workshops are done in labs equipped with personal computers and the practical work done under the leadership of a teacher on the above mentioned topics. The course work is elaborated out of classes and is checked, corrected and marked by the lecturer in the classes for course work. The final mark is formed from the results of the course work and two control works.

S00846 Higher Mathematics - 2

ECTS credits: 6 **Weekly classes:** 2lec + 2sem + 0labs + 0ps
Assessment: exam **Type of exam:** written and oral
Departments involved:
Department of Mathematics
Faculty of Natural Sciences and Education
Lecturers:
Assoc. Prof. Julia Chaparova, PhD, Dept. of Mathematics, tel. +359 888 226, E-mail: jchaparova@uni-ruse.bg
Assoc. Prof. Yuriy Kandilarov, PhD, Dept. of Mathematics, tel. +359 888 725, e-mail: ukandilarov@uni-ruse.bg
Abstract:
This subject is fundamental for mathematics education in engineering sciences. The goal is to get students acquainted with the basic notions of mathematical analysis, and give them practical computational abilities. Students can use the gained knowledge for further study of higher mathematics – part 3, physics, computer sciences.
Course content:
Definite and Line integrals, Partial derivatives, Differential Equations, Complex Functions, Laplace transform.
Teaching and assessment:
The educational process is realized by lectures and seminars. Lectures present the basic notions and methods for exploring the problems. There is a final written and oral exam at the end of the course.

S01022 Physics - 2

ECTS credits 4 **Weekly classes:** 2lec + 0sem + 1lab+ 0ps + p
Assessment: exam **Type of exam:** written, test
Departments involved:
Department of Science, Machine Elements, Engineering Graphics and Physics (MSMEEGPh)
Faculty of Transport
Lecturers:
Assoc. Prof. Petko Hristov Mashkov, MEng, PhD, Dept. of MMEEG and Physics, tel.:+359 82 888 218,
E-mail: pmashkov@uni-ruse.bg
Assoc. Prof. Vladimir Mateev Mateev, MEng, PhD, Dept. of MMEEG and Physics, tel.: +359 82 888 583,
E-mail: vmateev@uni-ruse.bg
Abstract:
The course aim is to introduce students to the physical character of processes and phenomena in nature and the methods of their investigation, with the most general properties of the matter and material objects. The laboratory exercises aim at creating skills for experimental investigation of physical phenomena.
Course content:
Electromagnetic field. Wave, geometric & quantum optics. Elements of Semiconductor physics and of Atomic & Nuclear physics.
Teaching and assessment:
Lectures give the main theoretical material, supported by some experimental and multimedia demonstrations of physical phenomena and processes. At the laboratory sessions the students work experimentally and investigate particular physical phenomena. During term students prepare a scholarly essay. Student knowledge of the theoretical material is tested regularly. The exam is in a form of test. The end mark depends on the results of the test, of the laboratory sessions and of the scholarly essay.

S01045 Programming and Computer Applications - 2

ECTS credits: 5 **Weekly classes:** 1lec + 0sem + 0labs + 2ps+ ca
Assessment: exam **Type of exam:** written
Departments involved:
Department of Informatics and Information Technologies
Faculty of Natural Sciences and Education
Lecturers:
Prof. Tzvetomir Ivanov Vassilev, MEng, PhD, Dept. of Informatics and Information Technologies, tel.:+359 82 888 475, E-mail: tvassilev@uni-ruse.bg
Principal Assistant Metody Lyubchev Dimitrov, MEng, PhD, Dept. of Informatics and Information Technologies, tel. +359 82 888 470, E-mail: mdimitrov@ami.uni-ruse.bg
Abstract:
The course is a natural continuation of Programming and Computer Applications – part I. The lectures introduce the main data structures (arrays, strings, structures, files) and algorithms for their processing. The workshops aim at developing skills in the students to build algorithms and programs using such structures.
Course content:
Expressions. Branches. Functions. Sorting and binary array search. Strings. Structures. Files.
Teaching and assessment:
The lectures clarify the theoretic aspect of the topics and have a sufficient number of examples. This enables the students to prepare in advance for the workshops and to work independently during the classes.
The workshops are held in computer labs. The students do practical work developing, testing and debugging programs. Every student is assigned an individual task, which he/she has to develop and present.
The exam is written. It comprises problems that require developing a program and a theoretic question. The problems have several items with an increasing level of difficulty.

SB15438 Theory of Electrical Engineering 1

ECTS credits: 6 **Weekly classes:** 2lec + 2sem + 0labs + 0ps
Assessment: exam **Type of exam:** written and oral
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Tsvetelina Georgieva, PhD, Dept. of Automatics and Electronics, tel.:+359 82 888 668, E-mail: cgeorgieva@uni-ruse.bg
Principal Assistant Martin Deyanov, PhD, Dept. of Automatics and Electronics, tel.:+359 82 888 678, E-mail: mdejanov@uni-ruse.bg
Abstract:
The course Theory of Electrical Engineering 1 introduces the students with the bases of the electromagnetism and with the main methods for analysis of settled modes in linear electric chains. The acquired knowledge is a basis for Electrical Engineering 2 and for all electrical courses.
Course content:
Bases of the electromagnetism – main concepts; electro-magnetic field; electric current; electric voltage, electric potential, electricmoving voltage; magnetic field; law of electro-magnetic induction; electric and magnetic energy; Maxwell's equations, scalar and vector potential; transforming the energy of electro-magnetic field, Pointing theorem, transmitting energy over a two-wire line and transformer connection.
Steady-state regimes in linear electric chains – main concepts and laws; constant modes in electric and magnetic chains; conversion, methods of analysis, principle and theorems for electric chains; Quantities and regimes in sinusoidal steady state, series and parallel RLC circuit, Ohm's and Kircchoff's laws in complex form, resonance phenomena; steady-state non-sinusoidal regimes; three-phase circuits; Two-port networks.
Teaching and assessment:
Lectures present the teaching material according to the syllabus. At the tutorial exercise, students solve problems covering the topics of the syllabus.
The final assessment is done via examination, conducted in a written and oral form.

S00411 Electrical Material Science

ECTS credits: 5 **Weekly classes**: 2lec + 0sem + 2labs + 0ps
Assessment: continuous assessment **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Ognyan Nikolaev Dinolov, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 531, E-mail: odinolov@uni-ruse.bg
Prof. Ivaylo Stefanov Stoyanov, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 843, E-mail: stoyanov@uni-ruse.bg
Abstract:
In the developed course of lectures, the materials structure is considered and the theoretical foundations of the more important observed processes are presented. The materials main characteristics and parameters are being investigated. Possible fields of application in electrical and electronics engineering are briefly discussed. Some issues on the reliability of materials are analyzed.
During the exercises, some of the most important processes, phenomena and properties discussed in the lectures are experimentally investigated using modern measuring equipment and computer technologies.
The course is based on the subjects Higher Mathematics, Physics and others and realizes input connections with the subjects Electrical Measurements, Theoretical Electrical Engineering, Fundamentals of Automation and more.
Course content:
Dielectrics and dielectric materials. Physicochemical properties of materials. Semiconductor Materials. Conductive materials. Ferromagnetic materials. Nuclear power engineering materials.
Teaching and assessment:
The students' training is based on classical didactical approaches. Interactive whiteboards, specialized software and videos are used during the lecture presentations. Student self-study time is provided under the supervision of the teacher. The usage of appropriate Internet resources for further training is recommended. Students prepare themselves for the exercises in advance. In the beginning of each exercise, students undergo compulsory examination for their knowledge. The attestation of the discipline is obtained when all exercises are completed. The assessment is written. The final grade is formed on the basis of the results from the subject tests, the examinations in the beginning of the exercises and on the course assignment.

S03257 English 2, S03258 German 2, S03290 French 2, S03294 Russian 2

ECTS credits: 4 **Weekly classes:** 0lec + 0sem + 0labs + 3ps
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Foreign Languages (FL), Faculty of Mechanical and Manufacturing Engineering
Lecturers:
Snr Lec. Elitsa Dimitrova Georgieva, Dept. of FL, tel.:+359 82 888 532, E-mail: edgeorgieva@uni-ruse.bg
Snr Lec. Diana Ilieva Stefanova, Phd, Dept. of FL, tel.:+359 82 888 532, E-mail: dstefanova@uni-ruse.bg
Snr Lec. Sergey Vasilev Bartenev, Dept. of FL, tel.:+359 82 888 824; E-mail: sbartenev@uni-ruse.bg
Snr Lec. Iliyana Gancheva Benina, Phd, Dept. of FL, tel.:+359 82 888 815; E-mail: ibenina@uni-ruse.bg
Abstract:
The foreign language course as stipulated in this syllabus aims at achieving communicative competence in the students'relevant subject area and future profession by building on the knowledge obtained in the previous semester. The main objective of the training is to expand students ' knowledge of the structure of the foreign language, the main grammatical categories, the specialized vocabulary and terminology of their degree course and chosen career. In addition, the course raises the students' awareness of some of the major features of the scientific style and aims at preparing them for effective communication in an academic environment.
Course content:
The four language skills of reading, listening, speaking and writing are developed in parallel within several key thematic areas: 1. Engineering: Electricity, Electricity production and distribution, Safety instructions and Regulations, Monitoring and Control systems, Robotics and Mechatronics. 2. English for Academic Purposes: Description of Processes, Use and Analysis of information from Multiple Sources; Written reports describing trends and/or comparing data from different sources; Participation in discussions; Characteristics of the scientific text.
Teaching and assessment:
The lessons are taught through practical classes. The training is implemented by applying personal-oriented and activity-oriented approaches, focusing on teamwork to solve problems and tasks**.** The syllabus follows the spiral principle of repeatability and gradual expansion of knowledge, skills and competences within the thematic areas. The semester is validated if classes have been attended regularly and ends with a formative assessment achieved through written tests and evaluation of oral tasks.

S03035 Mathematics 3

ECTS credits: 4
Weekly classes: 2lec + 0sem + 0labs + 1ps
Assessment: exam
Type of exam: written
Departments involved:
Department of Numerical Analysis and Statistics
Faculty of Natural Sciences and Education
Lecturers:
Assoc. Prof. Ilyana Petrova Raeva, MSc, PhD, Dept. of Numerical Analysis and Statistics,
tel.:+359 82 888 606, E-mail: iraeva@uni-ruse.bg
Principal Assistant Stefka Romanova Karakoleva, MSc, PhD, Dept. of Numerical Analysis and Statistics,
tel.:+359 82 888 606, E-mail: skarakoleva@uni-ruse.bg
Abstract:
The objective of the Course on S03035 Mathematic 3 is to students knowledge and skills to solve engineering problems requiring: Fourier series; The most common numerical methods of linear algebra and mathematical analysis; Mathematical apparatus of probability theory, the methods of mathematical statistics for processing experimental data.
Course content:
Fourier series, Numerical methods for solving systems of linear equations, non-linear equations, systems of non-linear equations, least squares method for approximation of tabulated data. Elements of theory of probability, elements of statistics and data analisys.
Teaching and assessment:
The lecturers present the material theoretically and illustrate it with appropriate example problems. The practical classes take place in computer labs. They are lead by the teacher as an organized problem solving on a material from the lecture topics. The practical classes include also gaining experience with the software products MATLAB and SPSS. Two control works are taken during the semester - they give the student the opportunity to get their final mark on the course without going on an exam- with minimum marks “Good (4)” on each one of the control works. The course ends up with a written exam and a colloquy with the student if needed.

SB15439 Theory of electrical engineering 2

ECTS credits: 5
Weekly classes: 2lec + 0sem + 1labs + 0ps + ca
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Stanislav Penchev, PhD, Dept. of Automatics and Electronics, tel.:+359 82 888 379,
E-mail: msp@uni-ruse.bg
Principal Assistant Martin Deyanov, PhD, Dept. of Automatics and Electronics, tel.:+359 82 888 678,
E-mail: mdejanov@uni-ruse.bg
Abstract:
The course Theory of Electrical Engineering 2 familiarizes the students with the main methods for analysis of transient modes in linear electric circuits and with the main methods for analysis of steady-state and transient processes in distributed circuits and in non-linear electric circuits.
Course content:
Transient response in linear electric circuits - introduction; classical method; operator method; frequency method; transient quantities, Duamelle integral; method with state variables.
Circuits with distributed parameters - main concepts; differential equations of a homogeneous line; sinusoidal steady-state process in a homogeneous line, input impedance; lossless lines, standing waves.
Non-linear electric circuits – steady-state regimes, basic laws and methods for analysis; periodic regimes, inert and non-inert electric circuit elements, methods for analysis; resonance phenomena; transient processes, methods for analysis, etc.
Teaching and assessment:
In the middle of the semester, each student receives an individual course work. It should be presented at the end of semester in a written form and is defended orally.
The final assessment is done during the exam in written and oral form, which contains practical problems and theoretical questions.

SB15440 Electrical measurements

ECTS credits: 5 **Weekly classes**: 2lec + 0sem + 2labs + 0ps
Assessment: continuous assessment **Type of exam**: written test
Departments involved:
Department of Automatics and Electronics, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.: +359 82 888 741,
E-mail: skadirova@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
"Electrical Measurements" course has the aim to make the students familiar with the basic methods and devices for electrical and non-electrical quantities evaluating as well as the metrical appraisals and results calculating. Another aim is students to acquire skills and habits which might be needed in measurement schemes realizing and to solve particular problems as well as in students' activities as forth coming experts – electrical engineers. The knowledge and skills acquired on this module are needed for the students to perceive the particular modules during the tutorials for metrical design ensuring of the technologic and production processes.
Course content:
Quantitative analysis and quantitative methods; Identification of a measuring method; Identification of a calculating method; A quality of the quantitative appraisals; Electrical and magnetic quantities; Assigning values to the electrical and magnetic quantities; Electrical quantities measuring by immediate comparison; Electrical quantities by mediate comparison; Digital electro-measuring appliances; Appliances for registration and observation; Electrical quantities calculating; Quantitative analysis of non-electrical quantities by electrical methods and devices; System for ensuring the unity of the measurements.
Teaching and assessment:
The process of the education on "Electrical Measurements" module consists of lectures and tutorials. Lantern-slides and experimental models might be used as guides.
Normally the tutorials are carried out into cycles. There are four places of work at the hall where on the average three students work together on each of it. The duration of each tutorial is three hours and at the end the students have to prepare a report. During the all semester long marking is realized by testing at the time when the tutors are in progress and by periodical test control. The education completes with an exam at the end of third semester. Individual tutorials are carried out regularly at previously announced time for this purpose.

S03229 Electronics and Microprocessor Systems

ECTS credits: 6 **Weekly classes**: 2lec + 0sem + 2labs + 0ps + ca
Assessment: exam **Type of exam**: written
Departments involved:
Department of Automatics and Electronics, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Anelia Vladimirova Manukova, MEng, DSc, Dept. of AE, tel.: +359 82 888 404,
E-mail: amanukova@uni-ruse.bg
Principal Assistant Snejinkja Lyubomirova Zaharieva, MEng, PhD, Dept. of AE, tel.: +359 82 888 382,
E-mail: szaharieva@runi-ruse.bg
Principal Assistant Yavor Branimirov Neikov, MEng, PhD, Dept. of AE, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
The subject Electronics and microprocessor systems is aimed at students from the Electrical Power Engineering speciality, studying for Bachelor's degree. It introduces students with base groups of semiconductors, power supply devices and electronic components in analog, digital and microprocessor circuitry. There are studied the most commonly used electronic control devices in industry and power engineering – generators, power supply units, converters, amplifiers, digital schemes, controllers, etc.
The subject gives basic knowledge in help of studying in Electrical machines, Electric drive, Electronic devices and systems in the agriculture, Electrical transport and others.
Course content:
Diodes, Transistors Thyristors. Power supply devices and converters. Electronic power amplifiers. Operational amplifiers. Functional generators. Analog and Digital circuitry. Microprocessor systems. Programmable logical controllers. Electronic devices in energetics.
Teaching and assessment:
The basic topics from the themes in the course are discussed in lectures, which are 2 hours per week. The exercises are two hours long and follow the lectures. The student prepares individual protocol. The workshops evaluation is taken in account in the final mark of the subject.

S03147 Engineering Mechanics

ECTS credits: 5 **Weekly classes:** 2lec + 2sem + 0labs + 0ps
Assessment: continuous assessment **Type of exam:** tests
Departments involved:
Department of Engineering Mechanics
Faculty of Mechanical and Manufacturing Engineering
Lecturers:
Assoc. Prof. Velina Stoyanova Bozduganova, MEng, PhD, Dept. of Engineering Mechanics,
tel.: +359 82 888 224, E-mail: velina@uni-ruse.bg
Principal Assistant Dimitar Stefanov Velchev, MEng, PhD, Dept. of Engineering Mechanics,
tel.:+359 82 888 224, E-mail: dvelchev@uni-ruse.bg
Abstract:
The course has four parts: Static, Strength of Materials, Kinematics, Dynamics. The aim of the course is the students to get acquainted with the basic laws and methods of Engineering Mechanics in order to apply them when they solve mechanical problems. Preliminary knowledge in Mathematics and Physics are necessary for this course. The subject is a fundamental for the engineering courses Control Theory, Electromechanical Devices, Dynamics of Mechanical systems, Machine Elements and Mechanisms, Hydraulic Machines and Pneumatics, Mechatronic Elements and Mechanisms, Robotics.
Course content:
Equilibrium of a rigid body. Equilibrium in presence of friction. Basic definitions and principles in Strength of Materials. Tension and compression. Particle kinematics. Translational, rotational and plane rigid body motion. Particle dynamics. Dynamics of mechanical systems. Lagrange's equations.
Teaching and assessment:
The lectures elucidate the theoretical basis of studied topics, while their application is illustrated by examples. Numerical examples are solved in seminar exercises. The final grade of student's knowledge is obtained by a Test System, which contains two tests and takes into account the activity of the students in the seminar exercises.

S03230 Fundamentals of Automation

ECTS credits: 5 **Weekly classes:** 2lec + 0sem + 1labs + 0ps + p
Assessment: exam **Type of exam:** written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Donka Ilieva Ivanova, MEng, PhD, Dept. of Automatics and Electronics, tel.: +359 82 888 266,
E-mail: divanova@uni-ruse.bg
Principal Assistant Nikolai Petkov Valov, MEng, PhD, Dept. of Automatics and Electronics,
tel.: +359 82 888 266, E-mail: npvalov@uni-ruse.bg
Abstract:
The subject gives knowledge for automation control systems of the technological objects. In the lectures are discussed the principles and technical realization of the transducers, controllers and actuators. The course has connections with the subjects: Automation systems in power supply, Electronic devices and systems in the agriculture and food production etc.
Course content:
The structure of automation system. The types. The transfer function. The dynamic characteristics. The models and dynamic elements connection. The technology processes and the objects for control. The automation measurements of basic technology values. The industrial controllers. The actuators and valves
Teaching and assessment:
In the lectures are discussed the basic topics from the themes in the course. The exercises follow the lectures. The student prepares individual protocol. The workshops evaluation is taken in account in the final mark of the subject.

S03231 Electrical Machines 1

ECTS credits: 7
Weekly classes: 2lec + 0sem + 3labs + 0ps + p
Assessment: exam
Type of exam: written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Anka Hristova Krasteva, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 301, E-mail: akrasteva@uni-ruse.bg
Abstract:
The subject has the objective to acquaint the students with the transformers and direct current machines arrangement, principle action, theory, characteristics and research methods.
Course content:
General issues of the electrical machines theory. General knowledge of the machines. Structure and principle action of direct current machines. Armature windings. Armature reaction. Inducing electromotive force in the armature windings. Electromagnetic torque. Commutation. Direct current generators and motors. Types. Characteristics. Special types of direct-current motors. Electrical machines with electronic commutation. Transformers arrangement and principle action. Modes of operation. Winding and group connection. Parallel operation. Transformer voltage control. Special transformer types.
Teaching and assessment:
The theoretical basic issues on all topics from the syllabus, presented at the lectures, are further practiced during the laboratory exercise. The students must prepare for the laboratory exercise in advance. The exam is conducted in written form and consists of two subject questions. The final examination mark depends on the mark received on the laboratory exercise.

S003232 Electrical Networks and Systems

ECTS credits: 6
Weekly classes: 3lec + 1sem + 0labs + 1ps
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Ivaylo Stefanov Stoyanov MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 843,
E-mail: stoyanov@uni-ruse.bg
Assoc. Prof. Ognyan Nikolaev Dinolov, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 531, E-mail: odinolov@uni-ruse.bg
Abstract:
The subject has the objective to provide knowledge and skills in the area of electrical networks. The issues about the stationary operation modes of both the opened and closed networks and the different methods for determining the cut of the air and cable electrical ducts are discussed. The study material is directly connected with all main subjects of the specialty. The input links are with the subjects: “Theory of Electrical Engineering”, “Mechanics” and others. The output is with: “Electrical part of electrical power plants and electrical power stations”, “Power supply” and “Final year project”.
Course content:
Constructive elements of electrical networks. Stationary operation modes of the opened electrical networks. Voltage regimes, power and energy losses. Methods for determining the cut of the conductors. Closed electrical networks. Methods for determining the power distribution. Voltage, power and energy losses. Regulating of the voltage and frequency in the electrical systems. United energetic systems.
Teaching and assessment:
Along the classical lecture forms, visual aids are used during some parts. The laboratory practice follows the lecture material in a synchronized way. The students are supposed to be acquainted with the main issues of the previous lecture in advance. The lecturer provides continuous assessment of the learning process of the taught material via the learners’ participation in the laboratory practice.

S03233 Electrical Networks and Systems – Course Project

ECTS credits: 4
Weekly classes: 0lec + 0sem + 0labs + 0ps
Assessment: defense
Type of exam: written and oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Ivaylo Stefanov Stoyanov, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 843, E-mail: stoyanov@uni-ruse.bg
Assoc. Prof. Ognyan Nikolaev Dinolov, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 531, E-mail: odinolov@uni-ruse.bg
Abstract:
The course project aims at consolidating the engineering knowledge and skills in the field of design of electrical networks. It is developed in two parts. Part one – design of electrical low voltage network for electrical supply of a small settlement, and Part two – providing outside electrical power supply for an industrial power user through medium and high voltage electrical pipelines. There are input links with the course “Electrical networks and systems”. There are output links with “Electrical power supply” and Final year project.
Course content:
The following developments are drawn up using determined parameters and situational plans: for Part one – the power consumption of a small settlement, maximum and minimum power mode. The low voltage network and the type of switchgear supplying the settlement are designed. For Part two – three versions of electrical power supply for an industrial user through medium and high voltage electric pipelines.
Teaching and assessment:
Each student receives an individual assignment and methodological instructions for developing a course project on electrical networks. In the course of the semester individual consultations are provided weekly and systematic monitoring of the project work is executed. The semester certification determines that the minimum technical requirements are met and the student has worked on the project systematically. When it is ready, the project is defended.

S00755 Short Circuits

ECTS credits: 5
Weekly classes: 2lec +2sem + 0labs + 0ps + ca
Assessment: continuous assessment
Type of exam: written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Assoc. Prof. Ognyan Nikolaev Dinolov, MEng, PhD, Dept. of Electrical Power Engineering,
tel.: +359 82 888 531, E-mail: odinolov@uni-ruse.bg
Abstract:
The course includes the symmetrical and asymmetrical short circuits. The nature of the short circuits processes, the fault-currents changes in time, and the influence of different factors over these processes are clarified. The practical methods for calculation of the fault currents in low and high voltage electrical networks are acquired. The methods and means for short-circuit currents limitation are considered.
Input connections: Higher Mathematics, Theory of Electrical Engineering, Electrical Machines, Electric Power Networks and Systems, High Voltage Equipment, Electrical Measurements, Programing and Usage of Computers.
Output connections: Electric Power Plants and Substations, Electric Power Plants and Substations – Course Project, Electrical Apparatuses, Protective Relying, Electric Power Supply, Electric Power Supply - Course Project, Technical operation of electrical systems, Diploma Thesis.
Course content:
Short-circuits overview. Three-phase short circuits. Practical methods for calculation of tree-phase short circuits. Asymmetrical short circuits. Limitation of the fault currents.
Teaching and assessment:
The lectures are delivered to the students at the beginning of the semester in hard copy and as a Web-based training tool. The lectures’ presentations include the use of technical means as multimedia projectors and interactive whiteboards. The seminar classes include the use of personal computers and software for fault current calculations. Two tests are to be held during the semester.

S03234 Electrotechnical drawing (AutoCAD)

ECTS credits: 3 **Weekly classes:** 0lec + 0sem + 0labs + 2ps + ca
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Electrical Power Engineering, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Orlin Lyubomirov Petrov, Meng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301, E-mail: opetrov@uni-ruse.bg
Assoc. Prof. Vyara Sabova Ruseva, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 616, E-mail: vruseva@uni-ruse.bg
Abstract:
The course Electrical drawing (AutoCAD) is mandatory for students in Electrical power engineering and electrical Equipment. The course aims to give the students basic knowledge and practical skills for work with the AutoCAD software for creating and editing electrical drawings.
The training is practically oriented and is suitable for acquisition of basic skills for working with AutoCAD. In practical exercises and by the course work the students acquire practical skills for preparing and making out electrical drawings by themselves.
Course content:
Understanding the interface of the program AutoCAD. Menus. AutoCAD settings. Function keys. Workspace. Scaling. Operating modes SNAP, GRID, ORTHO, OSNAP, OTRACK, POLAR. Drawing of straight and curved objects. Working with layers. Creating and managing layers. Modifying objects. Sizing. Working with texts. Patterns and filling. Adjustment of parameters. Working with blocks. Creation, insertion, editing and adding attributes. Creating and using libraries of 2D electrical symbols and units. Drawing electrical objects. Common rules for presentation and preparation of a drawing for printing.
Teaching and assessment:
Training is provided in subgroups. The course includes practical exercises only. In the beginning of each, one is presented a small theoretical part on the topic of the exercise. Multimedia is used for illustrating purposes. Then the practical exercises are conducted using personal computers with installed AutoCAD software. Students apply the acquired theoretical knowledge on the topic of exercise individually. The teacher answers the rising questions. He checks and if necessary indicates and helps students in fulfilling their assigned tasks.
The students outside classes make the course assignment. The accepting of these works, the validation of the acquired practical skills for work with AutoCAD and the final grade for the course is done in non-class time.

S03235 High voltage technique

ECTS credits: 5 **Weekly classes:** 2lec + 1sem + 1labs + 0ps
Assessment: exam **Type of exam:** written and oral
Departments involved:
Department of Electrical Power Engineering, Faculty of Electrical engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD, Dept. of Electrical Power Engineering,
tel.:+359 82 888 661, E-mail: kkoev@uni-ruse.bg
Assoc. Prof. Anka Hristova Krasteva, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 301, E-mail: akrasteva@uni-ruse.bg
Abstract:
The subject includes: the mechanism of the progress of discharge and pierces in gaseous, solid and liquid dielectrics; kinds of over voltages, reasons for theirs advent and their impact on technical devices and biological objects; the technical instruments for protection from over voltages. The students receive theoretical and practical knowledge needed for designing and exploitation of the electro energetic system and its elements.
Course content:
Sources for high voltage. Mechanism of the electric discharge in gases. Electric arc. Corona during high voltage. Discharge in gaseous, solid and combined isolation. Electric wave transitional processes. Switching over voltages. Atmospheric over voltages, lightning and lightning protection. Protection from over voltages. Coordination of the isolation.
Teaching and assessment:
The tuition is put into effect with the support of lectures and laboratory exercises. Suitable technical devices, prospective materials of foreign companies and ours and surge arresters are used for displaying the lecture material. The laboratory exercises are once at an interval of two weeks and are two academic hours long. On the first exercise there is an instruction for working with the high voltage devices. The current oversight is being realized with examining the students before the particular exercise and with the giving of the report from the exercise. The exam is conducted through written composing of two questions the lectures' material. There is also oral exam on some of the main problems of the subject.

S01837 Practice 1

ECTS credits: 2
Weekly classes: 2 weeks x 30 hours
Assessment: colloquium
Type of exam: oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Anka Hristova Krasteva, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 301, E-mail: akrasteva@uni-ruse.bg
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 661, E-mail: kkoev@uni-ruse.bg
Abstract:
The module of Manufacturing practice 1 aims to ensure students to acquire practical knowledge and develop their abilities in the areas of electrical equipment, electrical power supply and management of the energy services spheres of manufacturing companies.
Course content:
Energy sector – structure, planning and indication of the work performance of the Energy Service. Measuring and paying of the electrical and heat energy. Energy Balances.
Technical maintenance, repair and electrical safety of the electrical equipment. A structure of the electrical supply network and its main technical indicators, a schedule of reconstruction and upgrading of the network. A structure of the energy sector. Energy and technical parameters of the individual systems.
Teaching and assessment:
Before the specialized practice to be started the students will be given some instructions by both the teachers from the university and people from the company. Students will be reminded to bring their working clothing with them. During the practice students will be asked to make notes of what they have seen and use this information for the preparation of reports. They will be allowed to take part in the working process also. At the end of the practice there will be an exam where the teacher will has a conversation with each of the students and ask them different questions. The successfully passed colloquium ensures students to have this module endorsed in their student books.

S03236 Electrical Machines 2

ECTS credits: 6
Weekly classes: 2lec + 0sem + 2labs + 0ps + cw
Assessment: exam
Type of exam: written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Anka Hristova Krasteva, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 301, E-mail: akrasteva@uni-ruse.bg
Abstract:
The subject has the objective to acquaint the students with the induction and synchronous machines arrangement, principle action, theory, characteristics and research methods. Input links are the subjects: Higher Mathematics, Physics, Theory of Electrical Engineering and Electrical machines – part I. Output links: Automatic Electric Drive, Electrical Equipment and Electrical transport.
Course content:
General issues of the alternative current machines theory: windings, electromotive force, magnetomotive force, magnetic fields and inductive reactance of the alternative current windings. Induction machines arrangement and principle action. Modes of operation. Circuit and vector diagrams. Electromagnetic torque. Starting and speed control. Special types induction machines. Synchronous machine arrangement and principle action. Types. Modes of operation. Synchronous generators. Vector diagrams. Work in parallel. Angular characteristics. Static stability. Synchronous motors. Starting. Special types synchronous motors. Collector alternating current motors.
Teaching and assessment:
The theoretical basic issues on all topics from the syllabus, presented at the lectures, are further practiced during the laboratory exercise. Learning practice consists also of working out a course work. The students must prepare for the laboratory exercise in advance. The exam is conducted in written form and consists of three subject questions. The final examination mark depends on the mark received on the laboratory exercises and course work that is submitted before beginning of the examination session.

S03237 Electrical Apparatus

ECTS credits: 5 **Weekly classes**: 2lec + 0sem + 2labs + 0ps + p
Assessment: exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Assoc. Prof. Kyril Aleksandrov Sirakov, M.Sc.Eng. PhD, Dept. of Electrical Power Engineering,
tel.:+359 82 888 364, E-mail: csirakov@uni-ruse.bg
Abstract:
During the lectures, the main issues are discussed with regard to the basic physical processes, characterizing the electrical apparatus, their device, operating principle, function and main technical characteristics.
Course content:
General Information on the Electrical Apparatus. Electrodynamic Forces. Heating of the Electrical Apparatus. Electrical Contacts. Electric Arc. Electric Insulation of the Electrical Apparatus. Electromagnetic Systems. Commutation Apparatus for Low Voltage. Electrical Apparatus for Control. Electrical Safety Apparatus for Low Voltage. Electrical Apparatus for High Voltage.
Teaching and assessment:
The teaching is mainly based on lectures and laboratory exercises, in which multimedia projects, models, operating models and standard electrical apparatus are used. At the first lecture a conspectus, titles and authors of the preferable literature are submitted to the students. At the beginning of each study hour within several minutes, the material from the last lecture is summarized. At the end of the lecture, time is provided for questions and discussions of the taught material.
The laboratory exercises are held in a cycle of three or four exercises. Methodological indications are provided for all laboratory exercises. At the beginning of the exercise the students are acquainted with the specific laboratory installation and they connect electrical circuits. For the tests of the technical characteristics for the electrical apparatus, envisaged in the syllabus, industrial models are used.

S03238 Electric Power Stations and Substations Engineering

ECTS credits: 7 **Weekly classes**: 3lec + 1sem + 2labs + 0ps
Assessment: exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301;
E-mail: opetrov@uni-ruse.bg
Assoc. Prof. Ognyan Nikolaev Dinolov, MEng, PhD, Dept. of Electrical Power Engineering,
tel.: +359 82 888 531, E-mail: odinolov@uni-ruse.bg
Abstract:
With the suggested course, the students gain knowledge needed to rational design and use the electrical part of power stations.
Incoming connections: Higher Mathematics, Electro technical materials, Theoretical electrical engineering, Electrical machines, Electrical measurements, Technical safety, Electrical machinery, Electricity supply networks and systems and Technique of higher voltages and Short circuits. Outgoing connections: Electrical part of power stations – course work, Relay protection, Electric equipment, Electricity supply, Electricity supply networks in living areas, Regimes of the electrical power system.
Course content:
Production of electric energy. Exploitation regimes of work for distribution systems. Heating and electrodynamics act of current-carrying parts and machines. Power transformers and autotransformers. Electrical machinery for high voltage in distribution systems. Electrical scheme, construction realization and structure of distribution systems.
Teaching and assessment:
Teaching is based on the use of classic and pedagogical forms. Discussion of themes include use of media and materials from commercial companies(prospects, leaflets, etc.) Duration of the most laboratory exercises is two academic hours. They are teached in cycle and end with protocol. The student must be prepared for the laboratory exercise in advance. Calculation of the experimental results and design of protocol is realized at the end of the exercise and if necessery is finished later. Current control in the discipline is based on the answers of the students during the laboratory exercises. The discipline ends with exam which includes two themes for written answer and oral discussion.

S03239 Electric Power Stations and Substations Engineering – Course Project

ECTS credits: 4 **Weekly classes**: 0lec + 0sem + 0labs + 2ps
Assessment: defense **Type of exam**: oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301; E-mail: opetrov@uni-ruse.bg
Abstract:
The course work has for an object to improve student's knowledge in designing electrical part of distribution power system 110/6-20 kV.
Course content:
Electrical research involving: choice of the primary(major scheme) of the power station; calculating the current during normal regimes and short circuit in the distribution systems high and middle voltage; choice of exploitation regime for work of the star centre for the networks high and middle voltage.
Choice of: commutation apparatuses (circuit-breakers and disconnectors); current and voltage measuring transformers; flexible and hard connectors for electric circuit for high and middle voltage; insulators; fuse for protection of the cicuits "own needs" and "measurement"; serge arresters for protection from overload. The graphical part of the course work includes: full single-line diagram of the substation; conceptual plan for indoor switchgear; sections of MV cells of conventional MV switchgear or facades of complete switchgear; unfolded diagrams for control, measurements and interlock.
Teaching and assessment:
The designing of the course work is performed by individual assignment. It is in two variants: a substation with conventional switchgears or with complete switchgears. The assignment: the parameters of the distribution system high and middle voltage of the power station; calculated powers and length of the networks middle voltage, powered by the powerstation; the relays supply turn-off times. The designing of the course work is perform by week agenda. During discussions the results from the calculations are checked and the peculiarities for the next stage are explained. The course work is handed over at the end of the turm. The final examination mark is complex and depends on the design and the defense of the course work.

S03240 Electrical Drive

ECTS credits: 5 **Weekly classes**: 2lec + 0sem + 2labs + 0ps + p
Assessment: exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering,
Faculty of Electrical engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Anka Hristova Krasteva, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301; E-mail: akrasteva@uni-ruse.bg
Abstract:
The subject acquaints the students with the mechanics and energetic of the electrical drive, electromechanical characteristics of the DC and AC electrical drive as well as different operating mode of the electrical machines. The purpose of the subjects is for the students to receive practical and theoretical knowledge for different kind of electrical drive and their application.
Course content:
Mechanics of the electrical drive. Energetic of the electrical drive. Electromechanics characteristics of the DC and induction electrical drive. Special electrical drives. Electrical drives with static power converter.
Teaching and assessment:
The theoretical basic issues on all topics from the syllabus, presented at the lectures, are further practiced during the laboratory exercise through investigation of the examined electrical drives and formulation of individual reports. Students should prepare in advance for the laboratory exercises. The exam is conducted in written form and consists of two subject questions.

SB10643 Machine Elements and Mechanisms

ECTS credits: 3 **Weekly classes**: 1lec + 0sem + 0labs + 2ps
Assessment: continuous assessment **Type of exam**: oral
Departments involved:
Department of Repair, Reliability, Mechanisms, Machines, Logistic and Chemical Technologies (RRMMLCT)
Faculty of Agrarian and Industrial
Lecturers:
Prof. Ognyan Lyubenov Alipiev, MEng, PhD, Dept. of RRMMLCT, tel.:+359 82 888 593,
E-mail: oalipiev@uni-ruse.bg
Assoc.Prof. Tanya Petkova Grozeva, MEng, PhD, Dept.of RRMMLCT, tel.:082 888 258,
E-mail: tgrozeva@uni-ruse.bg
Abstract:
The course introduces the students to the main laws of structure and development of the mechanic systems, made of mechanisms, in witch the variety of mechanic elements are connected in a different way. Through the course the necessary knowledge is formed for investigations and designing of mechanisms and machine elements. Main topics of theory, practicing, and constructing different mechanic systems are studied in the course. To enter the course knowledge on Informatics, Technical Mechanics and Technical Documentation is necessary and the output links are all special technical courses.
Course content:
Basic concepts; Structure and classification of mechanisms; Analysis of lever, cam, toothed gearing and special mechanisms; Involute tooth transmission-geometric theory, Kinetostatics, figuring out the contact strength and sagging; connections; Elements of rotational motion – axis, shafts, bearings and connectors; Power transmissions; Balancing of mechanisms.
Teaching and assessment:
The theoretical terms given at lectures are acquired practically and assimilated in laboratory practical work. The lecture material and practical work are visualised with variety of kinematic models , makets of real mechanisms and machine elements, computer programs for stimulation of different processes and phenomena, installations and stands. Students also use paper and high-technological electronic carriers of information for self-training. Their knowledge is checked by 3 tests and 3 control works. Final rating ends with a current mark or test (if one of the sides isn't satisfied with the continuous assessment).

S03241 Electrical Power Equipment

ECTS credits: 6 **Weekly classes**: 2lec + 0sem + 2labs + 0ps
Assessment: exam **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering,
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Kyril Aleksandrov Sirakov, M.Sc.Eng. PhD, Dept. of Electrical Power Engineering,
tel.:+359 82 888 364, E-mail: csirakov@uni-ruse.bg
Abstract:
The objective of the subject is knowledge acquirement about electric equipment of specific common production aggregates and about their management schemes understanding. The ingoing links relate to the following subjects: "Electrical machines", "Electrical apparatus", "Electrical drives", "Analog and numeric electronics", "Hydro- and pneumatic machines". Outgoing links are with the following subjects: "Industrial processes electrical equipment", "Agricultural and food Industry electric equipment", "Electrical power supply" and Final Year project.
Course content:
Management schemes compilation principles. Heating devices, cranes, ventilators, pump aggregates electric equipment.
Teaching and assessment:
Visual aids are used during the lectures. Operative models are used during the laboratory exercises. Oral discussions and short tests (up to 5 minutes) are done during the lectures and laboratory exercises. Protocols submission is required for the acceptance of the laboratory exercises. The semester can be validated if all exercises are done, submitted and defended and if the student attended more than 50% of the lectures. The exam is written on two topics from the questionnaire and is followed by oral discussion on parts of other topics.

S03242 Electrical Power Equipment – Course Project

ECTS credits: 4
Weekly classes: 0lec + 0sem + 0labs + 2ps
Assessment: defence
Type of exam: oral and presentation
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Kyril Aleksandrov Sirakov, MEng, PhD, Dept. of Electrical Power Engineering,
tel.:+359 82 888 364, E-mail: ksirakov@uni-ruse.bg
Abstract:
The objective of the subject is systematizing, assimilating and increasing students' theoretical and practical knowledge, checking the students' ability for independent creative decision of engineer tasks. The tasks might be training, educational or practical. The ingoing links relate to the following subjects: "Electrical apparatus", "Electrical machines" and "Electrical drives". Outgoing links are connected with the Final Year project.
Course content:
The subject matter of the thesis is about development of electric equipment and scheme compilation. Schemes might be for management of upswing-transporting machines, flow lines, industrial, agricultural and food industry technological processes, metal cutting machines, etc.
Teaching and assessment:
The project assignment is proposed at the beginning of the semester with exact ingoing data and schemes for each student. Every week student must present the reached stage of work on which he/she will be examined. The course project must be submitted in the last week of the semester and after being checked by the lecturer, it must be defended.

S03243 Lighting and Installation Equipment

ECTS credits: 7
Weekly classes: 2lec + 0sem + 2labs + 0ps + cw
Assessment: exam
Type of exam: written
Departments involved:
Department of Electrical Power Engineering,
Faculty of Electrical engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301;
E-mail: opetrov@uni-ruse.bg
Assoc. Prof. Vyara Sabova Ruseva, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 616,
E-mail: vruseva@uni-ruse.bg
Abstract:
Discipline Lighting and Installation Equipment aims to provide knowledge and skills to students on key issues of lighting and installation equipment: terminology, variables, indicators, classifications, methods, element base, electrical circuit solutions safeguards, content projects, measurements and other.
Coursework in order to reinforce the knowledge and skills to create a practical implementation of the basic methods, approaches, solutions and structures in the design of the lighting system and the electrical system of a small residential, industrial, public or other building.
The course utilizes the students' knowledge of the subjects: Physics, Technical documentation, Electrical safety, Theoretical Electrical Engineering, Electrical materials, Electrical Measurements, Electrical machinery and electrical equipment.
Course content:
Basic concepts, light quantities and units. Optical radiation. Basic energy quantities and units. Heat and fluorescent radiation. Light properties of the bodies. Light measurements. Types of light sources. Fixtures. Types of lighting systems. Photometric design of lighting systems.
Introduction to Electrical Installation. Electrical components and systems. Electrical circuits. Technology to design of electrical installations.
Teaching and assessment:
Presented lectures on theoretical foundations are taught laboratory classes by examining the light source and installation devices. Individual reports must be created. The exam is written by two questions. The final assessment takes into account the assessment of coursework.

S03244 Electrical Transport

ECTS credits: 6 **Weekly classes**: 2lec + 0sem + 2labs + 0ps + p
Assessment: exam **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD, Dept. of Electrical Power Engineering,
tel.:+359 82 888 661, E-mail: kkoev@uni-ruse.bg
Assoc. Prof. Anka Hristova Krasteva, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301,
E-mail: akrasteva@uni-ruse.bg
Abstract:
The course aims at providing knowledge in the field of electric transport. Different systems and its components for electrical supply of electrical transport, the characteristics and behaviour of electric traction motors and power electronic converters, the characteristics and maintenance of accumulators are reviewed. Some attention is given to the maintenance of the catenary net and power electronic converters.
Course content:
Catenary net and catenary current collectors. Maintenance of catenary net. Traction substation supply systems. Electric traction motors. Power electronic converters. Technical maintenance of power electronic converters. Accumulators.
Teaching and assessment:
The lection's material is presented by classical pedagogic forms and present multimedia presentation techniques. The laboratory exercises follow the lectures. Practical problems are solved on the laboratory exercises. The current oversight is being realized with examining the students before the particular exercise and with the giving of the report from the exercise. The exam is conducted through written composing of two questions the lectures' material. There is also oral exam on some of the main problems of the subject.

S03245 Economics

ECTS credits: 3 **Weekly classes**: 2lec + 1sem + 0labs + 0ps
Assessment: continuous assessment **Type of exam**: written
Departments involved:
Department of Economics and International Relations
Faculty of Business and Management
Lecturers:
Assoc. Prof. Aleksandar Angelov Kosuliev, PhD, Dept. of Economics and International Relations,
tel.:+359 82 888 557, E- mail: akosuliev@uni-ruse.bg
Assoc. Prof. Nataliya Todorova Nedelcheva, PhD, Dept. of Economics and International Relations,
tel.:+359 82 888 416, E-mail: nnedelcheva@uni-ruse.bg
Principal Assistant Elizar Aleksiev Stanev, PhD, Dept. of Economics and International Relations,
tel.:+359 82 888 703, E-mail: eastanev@uni-ruse.bg
Abstract:
The subject is concerned with the general problems, laws and categories of the contemporary market economy. Thus it creates a certain basis for the remaining economic objects. It also gives general knowledge, which is expressed in alternative ways of economic viewing and which forms and creates abilities for independent and expert choice in economic surroundings. Course prerequisite is knowledge of mathematics and it is related to concrete branch and functional economic subjects.
Course content:
Introduction – the economic system and the fundamentals of economic theory. Market mechanism. Manufacture, company assets and expenses. Imperfect competition and supplying. Price formation and incomes depending on production factors: Gross domestic product and economic growth. Economic cycles, unemployment and inflation. Taxation, budget and monetary policy.
Teaching and assessment:
Material is taught in two ways – lectures and practical classes, which elucidate and develop further some of the issues discussed at lectures. Continuous assessment is carried out. It includes two test assignments and student performance during the semester. Final assessment is the average of the above-mentioned components of evaluation.

S03246 Thermal Energetic

ECTS credits: 4 **Weekly classes**: 2lec + 0sem + 1labs + 0ps
Assessment: continuous assessment **Type of exam**: written
Departments involved:
Department of Heat, Hydraulic and Environmental Engineering
Faculty of Agrarian - Industrial
Lecturers:
Assoc. Prof. Plamen Georgiev Mushakov, PhD, Dept. of Heat, Hydraulic and Environmental Engineering, tel .: +359 82 888 304, E-mail: pgm@uni-ruse.bg.
Abstract:
The course in "Thermal Power Engineering" includes the basics of "Technical Thermodynamics" and "Heat and Mass Exchange", with emphasis on "Applied Thermal Energy". The material is in line with modern concepts of energy efficiency and environmental friendliness. On the basis of the theoretical laws of ideal gases, the topics in the field of natural gas supply and liquefied hydrocarbon gases are presented. On the basis of the First and Second Laws of Thermodynamics and the Carnot Cycle the topics in the field of thermal motors, the principles of electricity production in thermal power plants, the principles of district heating, the refrigeration machine and the heat pump are presented.
Course content:
Basic thermodynamic concepts. The first law of thermodynamics. Private thermodynamic processes. Second law of thermodynamics. Real-gas thermodynamic processes. Gas and Vapor Leakage. Wet air thermodynamics. The basics of heat and mass transfer. Thermal conductivity. Convective heat transfer. Radiant and complex heat exchange. Cycles of thermal machines - Internal combustion engines, Piston compressors, Steamers, Compressor refrigerators, Heat pump cycle. Fuel Equipment - Fuels, Combustion Devices, Heat Generators. Heating, ventilation and air conditioning.
Teaching and assessment:
The common organization of training takes two forms: lectures and laboratory exercises. The lectures are delivered in the designated horology with a display of boards, tables, charts and multimedia. Laboratory exercises are carried out on laboratory facilities.

S03247 Production Practice 2

ECTS credits: 3 **Weekly classes:** 3 weeks x 30 hours
Assessment: colloquium **Type of exam**: oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 661, E-mail: kkoev@uni-ruse.bg
Assoc. Prof. Anka Hristova Krasteva, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301, E-mail: akrasteva@uni-ruse.bg
Abstract:
The subject includes: the organization structure and the functional problems of units apart in the real object of the electrical power system: electrical power plant, units of electrical transmission and electrical distribution companies, and the interactions of the units.
Course content:
Thermal Power Plant and Heating Association – the administration and management structure, the energy balance, forecasting and monitoring of the electrical and thermal energy consumption, energy efficiency. Units of the electrical transmission company - the administration and management structure, forecasting the work conditions and control of operations, maintenance of the electrical transmission network, organize of the balancing energy market. Units of the electrical distribution company - the administration and management structure, trade and delivery of electrical energy, management of imbalanced quantities of electrical energy, maintenance and development of the electrical distribution network, uninterruptible electric power supply and electric power quality.
Teaching and assessment:
The instruction is implemented in the University of Ruse, in the Thermal Power Plant and in the electrical energy companies, before the specialization practice. The university leader of practice remind the students to bring working dress. The students must to take notes of what is seed and what is done of units apart in the real object of the electrical power system during the practice. The taken notes are presented as a report in the end of the practice. At the end of the practice there is an oral exam over topics, marked in the diary and the term is valid. The successfully passed colloquium ensures students to have this module endorsed in their student books.

SB10646 Electrical Power Supply

ECTS credits: 8 **Weekly classes**: 3lec + 1sem + 2labs + 0ps
Assessment: exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Vyara Sabova Ruseva, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 616, E-mail: vruseva@uni-ruse.bg
Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301, E-mail: opetrov@uni-ruse.bg
Abstract:
Electrical supply is one of the main disciplines of the subject. The aim of the course is studying of basic questions from the theory and practice of designing, exploitation and management of the Electrical Power Supply Systems.The subject is based on knowledge received in the courses of “Theoretical Bases of the Electro Engineering”, “Electric Measurements”, “Electrical Machines”, “Electrical apparatus”, “Electrical Networks and Systems”, “Electrical Part of Electrical Power Plants and Electrical Power Stations”, “Relay Protection”, “Lightening and Installation Equipment”. The subject Electrical Power Supply is a prerequisite for the specializing subjects and the Final Year project..
Course content:
Basic elements and working regime of the Electrical Supply Systems. Classification and characteristics of the recipients of electrical power. Electrical load. Reliability of the electrical power supply. Quality of the electrical power. Schemes of electrical supply systems. Compensating of the reactive loads. Starting and self-starting of electrical machines. Protection of the electrical networks for low voltage. Rational use of electricity.
Teaching and assessment:
Suitable technical devices and prospective materials of foreign and Bulgarian companies are used for visualizing the lecture material. The laboratory exercises are held as cycles. Every exercise begins with oral exam and finishes with submitting a protocol. During the seminar exercises, the students work on solving practical problems that assist the development of the course project of the subject. The examination is conducted by solving test.

S03249 Electrical Power Supply - Course Project

ECTS credits: 4 **Weekly classes**: 0lec + 0sem + 0labs + 2ps
Assessment: defence **Type of exam**: oral and presentation
Departments involved:
Department of Electrical Power Engineering,
Faculty of Electrical engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Vyara Sabova Ruseva, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 616, E-mail: vruseva@uni-ruse.bg
Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301, E-mail: opetrov@uni-ruse.bg
Abstract:
The Course Project on the subject Electrical Power Supply is elaborated with the purpose of assimilating of the application of the basic methods, approaches, solutions, structures and elementary base during the designing of the electrical supply complex of the users of electrical power.
The initial connections are based on knowledge received during the courses on “Technical Documentation”, “Electrical apparatus”, “Electrical Networks and Systems”, “Electrical Part of Electrical Plants”, “Lightening and Installation Equipment”, “Relay Protection”. The exit connections are with the following subjects: “Technical Exploitation of Electrical Arrangements in the Industrial and agriculture enterprises”, “Automatic systems in the Electrical Power Supply” as well as Final Year project.
Course content:
There are two detached parts in connection with the Course Project: Part one – designing of the electrical supply system on low voltage in differentiated user (manufacture department, agricultural object) Part two – designing the electrical supply system of a business establishment. The specified in the designing practice textual and graphical documents should be worked out for both parts.
Teaching and assessment:
The development of the course project is done as individual assignment and on week schedule. The transitional results and the next problems are checked and specified during the period for individual week consultations. The Course Project should be submitted and defended in front of the manager of the project.

S03250 Protective Relying

ECTS credits: 6
Weekly classes: 2lec + 0sem + 2labs + 0ps + ca
Assessment: exam
Type of exam: written and oral
Department involved:
Department of Electrical Power Engineering
Faculty of Electrical and Electronic Engineering
Lecturers:
Assoc. Prof. Ognyan Nikolaev Dinolov, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 531, E-mail: odinolov@uni-ruse.bg
Abstract:
The course gives students the opportunity to gain knowledge and engineering skills, needed in the selection, the setting and the exploitation of relays protections for the objects of the electric power system. The specific features of various failures and emergency modes in which current regulations require activation of the relay protection are also reviewed. The conditions for determination of the necessary settings of the relay protections of power lines, busbars, transformers, motors and synchronous generators are given.
Incoming connections**:** Electrical Measurements, Theoretical Electrical Engineering, Electronics and Microprocessor Engineering, Electrical Machines, Electrical Power Networks and Systems, Short Circuits, High Voltage Engineering, Electrical Apparatuses, Electrical Equipment and Electrical Part of Power Plants and Substations. Output connections: Electric Power Supplying, Technical Operation of Electrical Systems, Technical Operation of Renewable Energy Sources and Diploma Project.
Course content:
The syllabus covers the relay protections of power lines, transformers, electric motors, generators and other electrical systems used in Bulgaria.
Teaching and assessment:
The teaching is conducted by lectures and lab exercises. The discussion of themes includes using media and prospect materials, web sites and laboratory benches with relay protections.
The duration of the laboratory exercises is two academic hours. They are conducted in cycles and end with reports.

SB10647 Renewable Energy Resources and Energy Technologies

ECTS credits: 8
Weekly classes: 3lec + 0sem + 2labs + 0ps + ca
Assessment: exam
Type of exam: written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Ivaylo Stefanov Stoyanov, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 843, E-mail: stoyanov@uni-ruse.bg
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD, Dept. of Electrical Power Engineering,
tel.: +359 82 888 661, E-mail: kkoev@uni-ruse.bg
Abstract:
The course aims at acquainting the students with the main issues connected with the different types of energy and energy resources, their rational usage, electrical power supply and protection of the environment in the enterprises, farms and companies.
Course content:
In the discipline Renewable energy and energy technology are being considered issues related with the types of energy sources and assessing their quality, energy supply (compressed air, water, oxygen, fuel oil, natural gas, etc.), secondary energy resources, rational use of energy, optimizing of the system Energy - Environment
Teaching and assessment:
The teaching is based on the usage of classical pedagogic forms. On every topic audio-visual materials are used and videos are shown. The synopsis, title and authors' names of suggested literature are given the students on the first topic. The lecturer generalize the last topic themes on the beginning of every new topic in few minutes. A time for questions and discussions is the end of the topic.
The laboratory labors is carrying out of cycle of three or fourth exercises. Methodical instructions are provided for all the laboratory exercises. The students studying the laboratory unit and they connect the electrical wires.
The students have to prepare a course task.
At the exam the students work on two questions in a written form, which help to estimate their degree of knowledge.

SB10648 Hydraulics Machines and Pneumatics

ECTS credits: 4 **Weekly classes**: 2lec + 0sem + 1labs + 0ps
Assessment: exam **Type of exam**: written
Department involved:
Department of Hydraulics and Environmental Engineering Ecology
Faculty of Agrarian and Industrial
Lecturers:
Prof. Gencho Stoykov Popov, MEng, PhD, Dept. of Hydraulics and Environmental Engineering Ecology, tel.:+359 82 888 580, E-mail: gspopov@uni-ruse.bg
Abstract:
The course provides fundamental instruction in the basic laws of fluid movement, canal and pipe flows, and calculation of pipeline parameters. It includes some principal issues concerning the construction and utilization of different types of hydraulic and pneumatic machines in electrical power engineering, in industry and agriculture. The course also examines some hydro-systems and some fluid-power drive machines.
Course content:
Fluid properties. Pressure, Basic equation of hydrostatics. Bernoulli's equation. Modes of movement and hydraulic resistance. Computing of hydro- and air-pipes. Structure and working principles of turbo-machines, displacement machine-pumps, fans, compressors and fluid-powered engines. Basic of theory of turbomachinery. Structure, adjustment and performance of machine systems. Hydraulic elements. Some hydraulic systems used as machine driving force.
Teaching and assessment:
Teaching is by lecture; lectures precede laboratory sessions, which take place when students already have some theoretical knowledge of the subject matter. At laboratory sessions students have access to experiment stands and are able to find out for themselves how the basic hydraulic machines and systems function. The exam is written. The final mark is formed after oral discussion with the student.

SB10652 Management Of Electrical Engineering

ECTS credits: 4 **Weekly classes**: 2lec + 0sem + 0labs + 3ps
Assessment: exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering,
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Vyara Sabova Ruseva, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 616, E-mail: vruseva@uni-ruse.bg
Abstract:
The subject acquaints the students with the methods and means of management in electrical engineering by the production, transfer, distribution, sale and usage of the electrical energy. Therefore the following topics are discussed: branch structure; optimization of the energy balance; energy marketing and goods policy; price policy and fees for the electrical energy; energy market prognosis; methods, systems and algorithms for electrical engineering management.
Course content:
Condition and development perspectives of the energetic. Organizational structure of the branch. Energy balance. Electrical energy value. Innovative, price and goods policy in energetic. Energy market prognosis. Methods, systems and algorithms for electrical engineering management. Regime management of electrical usage.
Teaching and assessment:
Visual aids, like video films, are used for the presentation of some topics. The seminar exercises follow the lecture topics in a chronological order and they have practical orientation. The final mark is formed on the basis of two written tests, done during the semester.

SB10653 The Industrial Electric Power Equipment Maintenance

ECTS credits: 4 **Weekly classes**: 2lec + 0sem + 0labs + 3ps
Assessment: exam **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD, Dept. of Electrical Power Engineering,
tel.: +359 82 888 661, E-mail: kkoev@uni-ruse.bg
Abstract:
The subject has the objective the students to learn how to organize and carry out the activities of the industry electric power equipment maintenance and the students be able to decide practical issues.
Course content:
The organization of the industry electric power equipment maintenance. The industrial heat and furnace electric power equipment maintenance. The maintenance of the electric apparatus for the protection and control processes of the electric power equipment. The electric power equipment maintenance. The electric power machines and transformers maintenance.
Teaching and assessment:
Teaching of the students is done via lectures and practical exercises. The lection's material is presented by classical pedagogic forms and present multimedia presentation techniques. The laboratory exercises follow the lectures and practical problems are decided during the exercises. The exam includes a written part on two topics from the study material, which is followed by oral discussion and forming of the final mark.

SB10654 Industrial Enterprises Electric Equipment

ECTS credits: 5 **Weekly classes**: 3lec + 0sem + 0labs + 3ps
Assessment: exam **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Kyril Aleksandrov Sirakov, M.Sc.Eng. PhD, Dept. of Electrical Power Engineering,
tel.: +359 82 888 364, E-mail: csirakov@uni-ruse.bg
Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD, Dept. of Electrical Power Engineering,
tel.:+359 82 888 301, E-mail: opetrov@uni-ruse.bg
Abstract:
The specific electric equipment of machines operating in industrial and chemical enterprises, their electric engines and management scheme's choice methods are studied in the subject. Attention is paid to the new trends in the electric equipment. The ingoing links relate to the following subjects: Electrical appliances, Electrical machines, Automatic electrical movement, Electronics, Electric equipment and Electrical power supply. Outgoing links are with the Final Year project development.
Course content:
Machines with continuous transport, electric trucks, elevators, compressing appliances, smithy-press and metal cutting machines and machines and appliances in the chemistry electrical equipment.
Teaching and assessment:
Different visual aids like slides and OHP are used during the lectures. Short written tests are done during the lectures. Each exercise begins with oral introductory control. Students who have shown unsatisfactory knowledge cannot attend the laboratory exercise. The exercises are carried out using of actual industrial models with real electric equipment. The exam includes a written part, consisting of two questions and oral examination on topics from the questionnaire.

SB10655 Lighting Equipment

ECTS credits: 3 **Weekly classes**: 2lec + 0sem + 2labs + 0ps
Assessment: continuous assessment **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD, Dept. of Electrical Power Engineering,
tel.:+359 82 888 301, E-mail: opetrov@uni-ruse.bg
Abstract:
Lighting equipment course aims to provide knowledge and skills of students in the design, operation, ergonomics, energy and economic efficiency of lighting systems. Issues about the photometric calculations, normalization, lightening and electrical parts of the lighting systems. Attention is drawn to the design of lighting systems and systems with a particular purpose. The roles of lighting as a factor in ergonomic, environmental, energy and economic efficiency.
The course Lighting equipment is a natural extension of the compulsory course Lighting and installation equipment. The course utilizes the students' knowledge of the courses: Physics, Electrical materials, Electricity, Electrical measurements, etc.
Course content:
Lighting as an ergonomic factor. Norm regulation of lighting systems. Types of lighting systems. Photometric design of lighting systems. Design and implementation of lighting systems. Daily natural and mixed lighting. Management of lighting systems. Energy and economic indicators of the lighting system.
Teaching and assessment:
Presented lectures on theoretical foundations are taught laboratory exercises, study of modern lighting systems (interior, spotlights, street, etc.). Individual reports must be created.
Complete the procedures for discipline is an ongoing assessment of knowledge and skills shown as a result of planned activities and courses. Assessment is forms from the basis of the results and the evaluations: conducted two tests during lectures; execution, documentation and presentation of the tasks of the exercises.

SB10656 The Agricultural and Food Industrial Electric Power Equipment Maintenance

ECTS credits: 4 **Weekly classes**: 2lec + 0sem + 0labs + 3ps
Assessment: exam **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD, Dept. of Electrical Power Engineering,
tel.: +359 82 888 661, E-mail: kkoev@uni-ruse.bg
Assoc. Prof. Anka Hristova Krasteva, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 301,
E-mail: akrasteva@uni-ruse.bg
Abstract:
The subject has the objective the students to learn how to organize and carry out the activities of the agricultural and food industrial electric power equipment maintenance and the students be able to decide practical issues.
Course content:
The organization of the agricultural and food industrial electric power equipment maintenance. The plant-growing electricall equipment maintenance. The stock-farming electrical equipment maintenance. The food industrial electrical equipment maintenance The maintenance of the electric apparatus for the protection and control processes of the electric power equipment. The electric power equipment maintenance. The electric power machines and transformers maintenance.
Teaching and assessment:
Teaching of the students is done via lectures and practical exercises. The lection’s material is presented by classical pedagogic forms and present multimedia presentation techniques. The laboratory exercises follow the lectures and practical problems are decided during the exercises. The exam includes a written part on two topics from the study material, which is followed by oral discussion and forming of the final mark.

SB10657 Agricultural and Food Industry Electric Equipment

ECTS credits: 5 **Weekly classes**: 3lec + 0sem + 0labs + 3ps
Assessment: exam **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Kiril Aleksandrov Sirakov, M.Sc.Eng. PhD, Dept. of Electrical Power Engineering,
tel.: +359 82 888 364, E-mail: csirakov@uni-ruse.bg
Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301, E-mail: opetrov@uni-ruse.bg
Abstract:
Specific electric equipment of agricultural and food industry machines, their electric engines and management scheme's choice methods is studied in the subject. An attention is stressed on new trends in the direction. The ingoing links relate with the following subjects: Electrical appliances, Electrical machines, Electrical movement, Electronics, Electric equipment. Outgoing links are with the following subjects: Electrical power supply, Industry and agriculture electrical appliances technical exploitation and diploma thesis development.
Course content:
Farming electric equipment: seed cleaning and drying installations, greenhouses. Electric equipment in stock-breeding: food preparation and distribution aggregates, shearing, ventilations and heating systems in stock-breeding and poultry, Electric equipment of metal cutting machines and food industry machines.
Teaching and assessment:
Through the lectures slides and pictures is used. Practical exercises carry out on cycle with the use of industrial models. Through the lectures students pass short time written exams. Students are allowed to attend the exercises if they have shown enough knowledge on oral examination. Through the exercises students receive tasks for nonstandard scheme decisions of management schemes. The exam carries out with written part - two questions and oral examination.

SB10658 Electronic Devices and Systems in Agricultural and Food Industry

ECTS credits: 3 **Weekly classes**: 2lec + 0sem + 2labs + 0ps
Assessment: continuous assessment **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Ivaylo Stefanov Stoyanov, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 843, E-mail: stoyanov@uni-ruse.bg
Assoc. Prof. Kiril Aleksandrov Sirakov, M.Sc.Eng. PhD, Dept. of Electrical Power Engineering,
tel.: +359 82 888 364, E-mail: csirakov@uni-ruse.bg
Abstract:
The course introduces students to basic types of electronic devices and computer systems used in agriculture and food industry. The material is seen in volume, providing necessary knowledge, educational qualification Bachelor. Studied course has prerequisites "Theoretical Electrical Engineering", "Electronics and Microprocessor Systems", "Electric", "Power Machines", "Electrical Measurements" and others. Students can use the obtained theoretical and practical knowledge on the subject in state examinations, development of the diploma project and in their future careers.
Course content:
Electronic devices for automation in the plant - soil, irrigation, harvesting. Computer systems for process control in the storage, processing and drying of agricultural products. Process management in livestock - regulation of the microclimate in livestock buildings, distribution of feed and feeding, milking, physiological parameter control, manure cleaning. Electronic systems for quality control of raw materials in the food industry. Protection and diagnostics of power electrical equipment.
Teaching and assessment:
The teaching of the discipline is carried out according to classical and innovative pedagogical approaches, corresponding to the policy for quality in higher education at the University of Ruse.

SB10659 The Renewable Energy Sources Maintenance

ECTS credits: 4 **Weekly classes**: 2lec + 0sem + 0labs + 3ps
Assessment: exam **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering,
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD, Dept. of Electrical Power Engineering,
tel.:+359 82 888 661, E-mail: kkoev@uni-ruse.bg
Abstract:
The subject has the objective the students to learn how to organize and carry out the activities of the renewable energy sources systems maintenance and the students be able to decide practical issues.
Course content:
The organization of the renewable energy parks electrical power equipment maintenance. The Solar power equipment and parks maintenance. The wind-generators systems maintenance. The biogas and geothermal systems maintenance. The maintenance of the electric apparatus for the protection and control processes of the electric power equipment. The electric power equipment maintenance. The electric power machines and transformers maintenance.
Teaching and assessment:
Teaching of the students is done via lectures and practical exercises. The lection's material is presented by classical pedagogic forms and present multimedia presentation techniques. The laboratory exercises follow the lectures and practical problems are decided during the exercises. The exam includes a written part on two topics from the study material, which is followed by oral discussion and forming of the final mark.

SB10660 Solar Energy Installation and Power Farm

ECTS credits: 5 **Weekly classes:** 3lec + 0sem + 0labs + 3ps
Assessment: exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering,
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Ivaylo Stefanov Stoyanov, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 843, E-mail: stoyanov@uni-ruse.bg
Assoc. Prof. Kiril Aleksandrov Sirakov, M.Sc.Eng. PhD, Dept. of Electrical Power Engineering,
tel.: +359 82 888 364, E-mail: csirakov@uni-ruse.bg
Abstract:
The aim of this class is to introduce the students with some specific parts, construction and the operation conditions of the power farm and the solar installations.
Course content:
Solar energy. Methods and technical equipments for measurements of the solar radiation. Determination of resource on the solar energy. Utilization of the solar energy. Thermal collectors and systems. Photovoltaic panels. Solar energy plants and photovoltaic power farms. Accumulate of the solar energy. Accumulate of the electrical energy. Economics of the solar energy installations.
Teaching and assessment:
The teaching is based on the usage of classical pedagogic forms. For some of the topics projecting materials and videos are being shown. The practical exercises follow the lecture topics and have practical orientation. When exploring the properties of semi-conductors, computer modeling is utilized. The exam is written and the results from the individual work are being considered as well. At the written exam the students work on two question from the lectures, which help to estimate the degree of knowledge.

SB10661 Wind and Hydroelectric Farms

ECTS credits: 3 **Weekly classes**: 2lec + 0sem + 2labs + 0ps
Assessment: continuous assessment **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Ivaylo Stefanov Stoyanov, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 843,
E-mail: stoyanov@uni-ruse.bg
Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301,
E-mail: opetrov@uni-ruse.bg
Abstract:
The course aims to form in the students the basic theoretical knowledge and practical skills needed in the construction and operation of wind energy systems and parks.
Input links: Mathematical modeling of objects and processes from renewable energy, the dynamics of the installations of renewable energy sources and so on.
Output links: Design and operation of installations and parks with renewable energy sources, diploma project.
Course content:
General Information on wind power stations. Specifications for AC generators. Turbines for wind power stations. Braking systems. Climatic and economic conditions for wind energy business. Wind circulations in Bulgaria. Energy and power of the wind. Wind energy audit and analysis of wind energy. Foundations, lightning protection, earthling and joining of wind power station to power system. Wind farms.
Teaching and assessment:
During the lectures, the theoretical subjects are read on topics. Before each laboratory, exercise is conducted monitoring in the form of tests and oral examination. The results of the controls during exercise are recorded in the definitive assessment of the exam. The exam is written by development of two questions from the syllabus.

S03254 Self Preparing for thesis

ECTS credits: 4 **Weekly classes**: 0lec + 0sem + 0labs + 0ps
Assessment: no **Type of exam**: no
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Supervisor
Abstract:
The subject has the objective the students to learn how to collecting and systematizing knowledge and skills learned in all the studies prior and presented these into developing the thesis of the field of elelctric power and electric equipment and its public defence.
Course content:
Compilation of the work program and schedule of the thesis preparing. Data acquisition, literature sources researching and analyze the known solutions. Determining the theoretical topics concerning to the thesis. Choice of the suitable project and research methods. Formulation the purposes and tasks of thesis.
Teaching and assessment:
The Self Preparing for thesis flows concerning to the compliant work program and schedule. The Self Preparing gives a chance of students to work independently in the university or in others libraries, computers halls, laboratories, manufactures. The students choices suitable project and research methods by guiding of the supervisor.
The Self Preparing for thesis successfully ends after performance all the tasks in the work program and supervisor’s approval the student’s report.
The Self Preparing for thesis is not assessed and its efficiency will be evidenced on the public defence of the thesis.

S03267 Thesis defence

ECTS credits: 10
Weekly classes: 0lec + 0sem + 0labs + 0ps
Assessment: thesis defence
Type of exam: oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Supervisor
Abstract:
The subject of the thesis is the students who all the semesters graduated to evidence knowledge and skills learned in all the studies prior and presented these into developing the thesis of the field of elelctric power and electric equipment and its public defence.
Course content:
Choice of thesis theme. Compilation of the thesis schedule. Compilation and presents information by literature sources researching, the theoretical topics concerning to the thesis. Choice and use of the present efficiency project and research methods to solve the thesis problem. Present the results, analysis, conclusions and recommendations. Formatting, printing and binding of the thesis. Giving the thesis to the supervisor, permit to thesis defence by chief of the department. Reviewing the thesis and defence of it.
Teaching and assessment:
The student choice thesis theme alone and working independently asking for advices the supervisor.
The student data acquisition, choices methods and solves the thesis problem by working in the university or in others libraries, computers halls, laboratories, manufactures. The supervisor gives advices to the student and he estimates the completeness of the thesis if all the tasks are solved. The chief of department gives permit to defence the finished thesis only.
The thesis is defend on the Examining Committee and it evaluates two rates – of the develop quality and of the defence. The thesis rate by the reviewer is reported too.

UNDERGRADUATE STUDIES IN ELECTRONICS

PROFESSIONAL STANDARDS OF A BACHELOR IN ELECTRONICS

Degree course: **Electronics**
Degree awarded: Bachelor of Engineering (**BEng**)
Professional Qualification: **Electronics Engineer**
Duration: **4 years (8 terms)**

The main goal of the Electronics degree course is to prepare Electronics engineers acquainted with the peculiarities of the electronics production, methods and instruments for development and exploitation of the electronic equipment in different areas of the industry, agriculture, services and other fields.

The education of **a highly qualified Electronics engineer** is guaranteed by:

- ✓ use of contemporary information technologies and a modern specialized laboratory equipment in the teaching process;
- ✓ provision of a highly qualified academic staff;
- ✓ curricula and syllabuses in accordance with European standards for Higher education in Electronics and the requirements of the labor market.

The curriculum comprises the following groups of courses:

- ✓ ***fundamental:*** mathematics, physics, technical documentation, programming and computer applications, work safety, electrical engineering, electrical measurements, foreign languages, economics, etc.;
- ✓ ***basic professional:*** semiconductor devices, signals and systems, theory of electronic circuits, analog, digital and microprocessor circuits, computer aided design in electronics, design, technology and reliability of electronic equipment, industrial controllers and other;
- ✓ ***narrow specialized:*** in the last semester students choose courses in the fiels of radio and telecommunications or industrial electronics. The following courses are studied: radiotechnique (receivers and transmitters); television and video technique; audio systems and sound processing systems; mobile cellular networks; as well as power semiconductor devices; electronic signal converters; industrial electronics; specialized microprocessor systems and other.

The main knowledge and skills required from the Electronics engineer include: design, development and testing of new electronic components and systems, maintenance and testing of an electronic equipment, ranging from industrial electronic components and systems trough to home and public sector electronic appliances; management and organization of the companies in the field of electronics; evaluation of the economic and energy efficiency of the manufacturing process and marketing and commercial activity in the electronics field.

Bachelor engineers in Electronics **can work** in a wide range of companies associated with electronics production, industry, transport, services and agriculture as experts in assembly, exploitation, repairing and maintenance of electronic equipment. They **can start their own business** in perspective fields of the applied electronics, signal safeguard control systems, electronic marketing and telecommunications.

CURRICULUM
of the degree course in ELECTRONICS

First year

Code	First term	ECTS	Code	Second term	ECTS
S02519	Mathematics - 1	7	S00846	Mathematics - 2	6
S02521	Physics - 1	6	S01022	Physics - 2	4
S02520	Programming and computer applications - 1	4	S01045	Programming and computer applications - 2	5
SB17670	Practice in electrical engineering	3	SB17664	Theory of Electrical Engineering - 1	5
S00133	Work Safety	2	S00411	Electrical Materials	5
S00366	Computer graphics	5			
	Elective groups of courses				
	Foreign languages - 1:	3		Foreign languages - 2:	5
S00424	English - 1		S00761	English - 2	
S00523	German - 1		S00763	German - 2	
S00683	French – 1		S00764	French - 2	
S00760	Russian - 1		S00842	Russian - 2	
	Total for semester:	***30***		***Total for semester:***	***30***

Second year

Code	Third term	ECTS	Code	Fourth term	ECTS
S03035	Mathematics - 3	4	SB17673	Analog Devices - 1	8
SB17665	Signals and Systems	6	SB17674	Theory of Control Engineering	5
SB17666	Semiconductor devices	5	SB17675	Electromechanical Devices	8
SB17671	Theory of Electrical Engineering - 2	5	S03196	Computer Organization	5
SB17672	Electrical Measurements	5	SB16086	Economics	4
S03191	Mechanical Engineering	5			
	Total for semester:	***30***		***Total for semester:***	***30***

Third year

Code	Fifth term	ECTS	Code	Sixth term	ECTS
S03198	Digital Devices	10	SB17680	Measurements in Electronics	6
SB17677	Analog Devices - 2	5	S03204	Microprocessor Devices	6
SB17678	Power Supply	6	SB17681	Design and Technology of Electronic Systems	6
SB17679	Theory of Electronic Circuits	6	S03205	Conversion Technics	4
S03202	Optoelectronics	3	SB17682	Electronic Control Devices	5
			SB17683	Course project on Analog Circuits	3
	Total for semester:	***30***		***Total for semester:***	***30***

Forth year

Code	*Seventh term*	*ECTS*	*Code*	*Eighth term*	*ECTS*
SB17685	Automation of the Design in Electronics	6	SB17693	Microelectronic Circuits	5
S03211	Industrial Controllers	6	SB17694	Electronic Security Systems	5
S03212	Course project on Microprocessor Systems	2	SB17695	Diploma practice	4
SB17686	Microelectronics	5			
	Elective groups of courses			***Elective groups of courses***	
SB17687	Electronic Signal Converters	6	SB11471	Specialized Microprocessor Systems	3
SB17688	Embedded Systems	6	SB17696	Industrial Electronic Systems	3
SB17689	Special and Power Semiconductor Components	2	SB17697	Industrial Electronics	3
SB17690	Radio Communications	2	SB10677	Mobile Cellular Radio Networks	3
SB17691	Electronic Regulators	3			
SB17692	Audiosystems	3	SB17698	BACHELOR THESIS	10
	Total for semester:	***30***		***Total for semester:***	***30***

Total for the training course: 240 ECTS credits

* - During the eighth semester 10 weeks are for direct contact classes, 2 weeks for diploma practice and 3 weeks for the preparation for a state exam or a Final year project.

S02519 Mathematics - 1

ECTS credits: 7
Weekly classes: 2l+2s+0lab+0ps+1ca
Assessment: exam
Type of exam: written
Departments involved:
Department of Mathematics
Faculty of Natural Science and Education
Lecturers:
Assoc. Prof. Yuriy Dimitrov Kandilarov, PhD, Department of Mathematics, tel.: +359 82 888 634,
E-mail: ukandilarov@uni-ruse.bg
Principal Assistant Anna Simeonova Lecheva, PhD, Department of Mathematics, tel.: +359 899 165 411,
E-mail: alecheva@uni-ruse.bg
Abstract:
The subject is fundamental and is a basic course from the mathematical study. It has the objective to give students the necessary knowledge for learning the following mathematical, fundamental and special subjects.
Course content:
The Mathematics 1 course includes: Complex numbers and multinomial. Matrixes, determinants. Systems of linear algebra equations. Vectors. Equations of a straight line in a plane, straight line and a plane in space, curves and surfaces. Linear spaces, linear operators, basic vectors and basic values. Number sets. Functions, back trigonometric functions. Number rops, convergence. Function limits, continuous systems. Differential calculation of a function of one variable. Main theorems of the differential calculation. Function research. Indefinite integral. Main methods of integration.
Teaching and assessment:
Lectures focus on problems and examples with the minimum of proofs. At the seminars students acquire skills to solve problems on the corresponding material.The student prepares a course work, which consists of solving computational and theoretical problems. Continuous assessment is based on the results of the tests and the course work. It participates in forming the final mark for the course. If the test mark of a student is at least 5 (on a scale from 2 to 6) the student is allowed to take a preliminary exam on the basic theory of the chapter. If the student passes successfully this exam, he/she gets a mark for this chapter (at least 5). In this way the student can get a final mark for the course before the exam session. The final exam consists of 6 problems (computational and theoretical). To pass, at least 3 of them must be solved. The final mark is formed after a discussion.

S02521 Physics - 1

ECTS credits: 6
Weekly classes: 2l+0s+2lab+0pr+ 0,5rep
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of Physics
Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Petko Hristov Mashkov, PhD, Dept. of Physics, tel. 888218; E-mail: pmashkov@uni-ruse.bg
Assist. Prof. Rostislav Kandilarov, PhD, Dept. of Physics, tel: 082 888 583; E-mail: rkandilarov@uni-ruse.bg
Abstract:
The course aims at familiarizing the students with the physical character of processes and phenomena in nature and the methods of their investigation, with the most general properties of the matter and material objects. The laboratory exercises aim at creating skills for experimental investigation of physical phenomena.
Course content:
Measuring physical quantities. Mechanics of material point and rigid body. Gravitation. Work and energy. Laps of conservation in mechanics. Molecular physics and thermodynamics. Electric field and electric current.
Teaching and assessment:
Lectures give the main theoretical material, supported by some demonstrations of physical phenomena and processes. At the laboratory exercises the student works independently and investigates particular physical phenomena.
The knowledge of laboratory exercises is tested regularly.
At the exam the students answer two theoretical questions and do one laboratory exercise.

S02520 Programming and Computer Application - 1

ECTS credits: 4 **Weekly classes:** 2l+0s+0lab+1pr
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Informatics and Information Technologies
Faculty of Natural Sciences and Education
Lecturers:
Prof. Tzvetomir Vassilev, PhD, Dept. of Informatics and IT, tel. 888 475, tvassilev@ami.uni-ruse.bg
Assist. Prof. Metodi Dimitrov, PhD, Dept. of Informatics and IT, tel. 888 470, mdimitrov@ami.uni-ruse.bg
Abstract:
The first part of the lectures has the objective to acquaint the students with the computer as a technical device and with the different kinds of software applications. The second part of the lectures is an introduction to the programming of Pascal and aims at developing students' skills for building up algorithms and computer programmes with medium level of difficulty. The program language C++ is discussed, which is widely spread and used in after subjects.
Course content:
Characteristic of the computer generations. Classification of computers. Central processor, Random Access Memory, representing information in the computer. Input/ output devices. Outer memory. Local and global computer nets. Internet. Operational systems and operational media with a friendly graphical interface - Windows. Application programmes - word processing systems, electronic sheets, data bases, systems with artificial intellect, graphical computer systems.
Teaching and assessment:
The lectures are 1 hour per week. The practice sessions take place in computer labs and the students work on the above topics under the lecturer's supervision. At the end of each stage the practical skills of the students are tested. At the end of the semester students' knowledge of the first part of the course is examined using a computer test of 50 questions. Students also do a test on the second part of the lecture material. The final mark includes a contribution from continuous assessment, the test marks and the evaluation of the course work.

S00133 Technical Safety

ECTS credits: 2 **Weekly classes**: 1l+0s+0lab+1pr
Assessment: Colloqium **Type of exam**: oral
Department involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Ivaylo Stefanov Stoyanov, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 843,
E-mail: stoyanov@uni-ruse.bg
Abstract:
The main objective of the course is to enable the students to assimilate the principles, approaches and methods for safety of technical and manufacturing systems. This objective is realised through the following activities: Studying the terms, definitions, aims and tasks of technical safety in accordance with state and European legislation; Methodological fundamentals for creating safe technical and manufacturing systems; Principles, methods and tools of mechanical, electrical, electro-magnetic, emission, vibration and noise safety; Ergonomics of engineering, efficiency and control of technical safety. Course prerequisites: knowledge of Physics, Machine Science and Materials Science. The course is a prerequisite for the specialist compulsory and optional courses, including the managerial ones.
Course content:
Technical safety – main terms and definitions. Methodological fundamentals of creating safe technical and manufacturing systems. Mechanical safety. Electrical safety. Electro-magnetic safety. Emission safety. Noise and vibration safety. Ray safety. Ergonomic fundamentals of the safety of technical and manufacturing systems. Safe activity. Evaluation of the efficiency of making the manufacturing equipment and processes safe. Control of labour safety.
Teaching and assessment:
The lectures are supported by examples in accordance with the specifics of the course. Laboratory work has experimental and investigative character. The students are required to be prepared in advance, which is checked by test questions. Two written tests are conducted on questions given in advance. The final mark is formed taking into account the results from the tests and student participation in the sessions.

SB17670 Practice in electrical engineering

ECTS credits: 3 **Weekly classes:** 1l+0s+0lab+2pr
Assessment: Colloqium **Type of exam:** written
Departments involved:
Department of Automatics and Electronics (AE)
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.:+359 82 888 741, E-mail: skadirova@uni-ruse.bg
Abstract:
The Practice in electrical engineering course aims to give first year students some introductory theoretical knowledge in the field of Electronics, Automation and Computing as well as to give beginners practical skills bearing in mind the different level from which the students start their studies at the university.
Course content:
Standard design documents in radio-electronics. Notation of elements in electrical circuits. Basic elements in electrical circuits, ways of connection. Types of electric measuring devices, measuring units, measurement errors. Basic elements in the systems for automatic control. Technologies for producing printed circuit boards. PC components, characteristics of the basic modules. Control computers.
Teaching and assessment:
Lectures are delivered every week for the first eight weeks. The practical sessions are conducted on a rotational principle in two specialized labs at the Department of Automatics and Electronics.
The final mark is formed during the last session. Each student must solve a test and a practical problem.

S00366 Computer Graphics

ECTS credits: 5 **Weekly classes:** 1l+0s+0lab+2pr+1ca
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Machine Science, Machine Elements and Engineering graphics
Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Vyarka Toncheva Ronkova, MEng, PhD, Dept. of MSMEEG; tel.: +359 82 888 491,
E-mail: vronkova@uni-ruse.bg
Abstract:
The Computer Graphics course teaches the designing methods, the regulation documents and the rules for working out and reading of constructing documents, the symbols for expressing specific details from the electrical industry and the possibilities and means for computing documentation, as well.
Course content:
Main characteristics and importance of the documentation of technical solutions. General requirements for the preparation of technical documents. Depicting of geometrical and technical objects (views, cuts). Complexity of the technical documentation. Drawing of details. Drawings of a jointed unit. Peculiarities in making drafts of items with electrical mounting, printing knot, integrated circuit, etc. Electrical schemes.
Teaching and assessment:
The lectures contain the theoretical material, which gives the grounding for the drafting of the technical documents. During the laboratory exercises problems are solved and directions are given for the working out of the documents from the course assignments. Method of assessment - continuous assessment. It is based on the results shown by the students at the completion of the course assignments and the two tests.

Foreign Language - 1
S00424 English; S00523 German; S00683 French; S00760 Russian

ECTS credits: 3
Weekly classes: 0l+0s+0lab+3pr
Assessment: Colloqium
Type of exam: written
Departments involved:
Department of Foreign Languages
Faculty of Mechanical & Manufacturing Engineering
Lecturers:
Snr Lecturer Elitsa Georgieva, PhD, Dept. of Foreign Languages, tel.:+359 82 888 532,
E-mail: edgeorgieva@uni-ruse.bg
Snr Lecturer Diana Stefanova, PhD, Dept. of Foreign Languages tel.:+359 82 888 532,
E-mail: dstefanova@uni-ruse.bg
Abstract:
The foreign language module 1 is aimed at achieving communicative competence in the area of the subject specialism and the future job. The teaching objectives comprise the development of reading comprehension skills to handle specialist texts and the acquisition of communication skills to interact successfully in professional settings and everyday situation
Course content:
Meeting people. Talking about the present and the past. Plans. Describing objects and places. Comparing things. Searching for information in catalogues. Linking facts and ideas. Applying for a job. The grammar material is connected with the lexical topics and situations
Teaching and assessment:
To acquire the necessary language knowledge and to develop skills in using the language as a means of communication a wide range of authentic and specially constructed texts (i. e. articles, diagrams and tables, brochures, catalogues, manuals etc.) as well as audio , video, and multimedia materials are used. Students are set an assignment to prepare a presentation on one of the studied topics. The final grade is based on the results of the test and the presentation.

S00846 Mathematics - 2

ECTS credits: 6
Weekly classes: 2l+2s+0lab+0pr
Assessment: exam
Type of exam: written
Departments involved:
Department of Mathematics
Faculty of Natural Sciences and Education
Lecturers:
Assoc. Prof. Julia Chaparova, PhD, Department of Mathematics, tel. 888 226, E-mail: jchaparova@uni-ruse.bg
Principal Assistant Anna Simeonova Lecheva, PhD, Dept. of Mathematics, tel.: +359 89 916 5411,
E-mail: alecheva@uni-ruse.bg
Abstract:
The Mathematics 2 course acquaints the students with the main issues of the mathematical analysis which are necessary for the further study of Mathematics III, Applicable Mathematics, Theory of electrical engineering, etc. Course prerequisite is Mathematics 1**.**
Course content:
Main topics: Definite integral and applications. Function of many variables. Differential equations. Multiple integrals. Curve and surface integrals. Field theory. Functional and degree rops.
Teaching and assessment:
The study material is presented in the lectures logically with the proper examples. Problems with theoretical and applicable character, aiding the understanding of the theoretical material, are solved during group work. The students' knowledge is checked by administering three tests during the semester, which are held during the lectures. Method of Assessment: The final assessment is done by an exam held in a written form, by giving problems and questions. The requirements for certifying the attendance meet the Inner Academic Regulations of the University - regular attendance of the seminars.

S01022 Physics - 2

ECTS credits: 4
Weekly classes: 2l+0s+1lab+0pr+0,5rep
Assessment: exam
Type of exam: written
Departments involved:
Department of Physics
Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Petko Hristov Mashkov, PhD, Dept. of Physics, tel.: +359 82 888 583,
E-mail: pmashkov@uni-ruse.bg
Assist. Prof. Rostislav Kandilarov, PhD, Dept. of Physics, tel: +359 82 888 583; E-mail: rkandilarov@uni-ruse.bg
Abstract:
The course aims at familiarizing the students with the physical character of processes and phenomena in nature and the methods of their investigation, with the most general properties of the matter and material objects. The laboratory exercises aim at creating skills for experimental investigation of physical phenomena.
Course content:
Magnetic field and electromagnetic induction. Mechanical oscillations and waves. Optical phenomena and laps. Elements of quantum mechanics, solid state physics and laser physics.
Teaching and assessment:
Lectures give the main theoretical material, supported by some demonstrations of physical phenomena and processes. At the laboratory exercises the student works independently and investigates particular physical phenomena.
The knowledge of laboratory exercises is tested regularly.
At the exam the students answer two theoretical questions and do one laboratory exercise

S01045 Programming and Computer Application - 2

ECTS credits: 5
Weekly classes: 2l+0s+0lab+2pr+1ca
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of Informatics and Information Technologies
Faculty of Natural Sciences and Education
Lecturers:
Prof. Tzvetomir Vassilev, PhD, Dept. of Informatics and IT, tel. 888 475, tvassilev@ami.uni-ruse.bg
Assist. Prof. Metodi Dimitrov, PhD, Dept. of Informatics and IT, tel. 888 470, mdimitrov@ami.uni-ruse.bg
Abstract:
The objective is to learn the main data structures (multitudes, records, files) and to develop students' skills to build up complex algorithms and computer programs using such structures. Course prerequisite is the knowledge of Programming principles and computer application 1.
Course content:
Programs with branching structure. Functions. Sorting and searching in one-dimensional array. Character strings. Structures. Files. MATLAB: interface, commands, numbers, variables, vector and matrix operations, script files, control operators, file functions, graphics.
Teaching and assessment:
The lectures clarify the theoretical side of the topics and are packed with ample examples. This enables students to prepare in advance for the practical exercises and to work independently during them.
Practical classes are conducted in rooms with personal computers and are practical work on compiling and setting up programs. Each student is given an independent assignment to develop and present.

SB17664 Theory of Electrical Engineering - 1

ECTS credits: 5 **Weekly classes:** 2l+2s+0lab+0pr
Assessment: exam **Type of exam**: written and oral
Department involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Tzvetelina Dimitrova Georgieva, PhD, Dept. of AE; tel.: +359 82 888 668,
E-mail: cgeorgieva@uni-ruse.bg
Abstract:
The Theoretical Electrical Engineering 1 course familiarizes the students with the main methods for analysis of settled and transient modes in linear electric chains. The acquired knowledge is the basis for Electrical Engineering 2 and all electrical courses.
Course content:
Physical fundamentals of electro-magnetic field – main concepts, electro-magnetic field, Gauss' theorem and Maxwell's postulate, electric current, electric voltage, electric potential, magnetic field, principle of continuity of magnetic flow, intensity, law of the full current, law of electro-magnetic induction, electric and magnetic energy. Settled modes in linear electric chains – main concepts and laps, constant modes in electric and magnetic chains, conversion, methods of analysis, principle and theorems for electric chains, sine modes and quantities, sine modes in serial and parallel RLC bi-pole, laps of Ohm and Kirhof in complex fashion, resonance phenomena, three-phase chains, periodic non-sine modes, quadripoles. Transient processes in linear electric chains - introduction, classical method, operator method, frequency method, transient quantities, Duamelle integral, method with state variables.
Teaching and assessment:
Lectures present the teaching material according to the syllabus. At the seminars students solve problems covering the topics of the syllabus. At the beginning of the semester each student is given an individual problem as course work. It has to be presented at the end of the semester in written form and is defended orally. Final assessment is accomplished via an exam, conducted in written and oral form.

S00411 Materials Science in Electronics

ECTS credits: 5 **Weekly classes**: 2l+0s+2lab+0pr
Assessment: continuous assessment **Type of exam**: written and oral
Department involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Ivaylo Stefanov Stoyanov, PhD, Dept. of Electrical Power Engineering, tel.: + 359 82 888 843,
E-mail: stoyanov@uni-ruse.bg
Assoc. Prof.Ognyan Nikolaev Dinolov, PhD, Dept. of Electrical Power Engineering, tel.: + 359 82 888 330,
E-mail: odinolov@uni-ruse.bg
Abstract:
The Materials Science course aims at familiarizing the students with the main electrical materials. They study the more important processes in the dielectrics, semi-conductors, conductors and magnetic materials and explore their main characteristics and parameters. The main processes in dielectrics, semiconductors, conductors and magnetic materials are studied; their main characteristics and parameters are examined.
Course prerequisites include Mathematics and Physics and it leads to the courses in Electrical Measurements, Electrical Engineering, Semiconductors, etc.
Course content:
Polarization of dielectrics in a constant and alternating electric field. Dielectricity of some materials. Electric conductivity of dielectrics. Dielectric losses. Break in the dielectrics. Conductors. Main dielectric and magnetic materials. Magnetic conductors. Active dielectrics. Semi-conducting materials. Influence of the exploitation on the properties of semi-conductors. Semi-conducting chemical compounds.
Teaching and assessment:
Teaching is based on the use of classical pedagogic forms. Some topics are illustrated by visual materials and videos. The laboratory exercises follow the lecture topics and have practical orientation. When exploring the properties of semi-conductors, computer modelling is utilized. Early taking of the exam is not allowed. At the exam the students work on two questions, which help to estimate the degree of knowledge, after which an oral interview is conducted.

Foreign Language - 2
S00761 English; S00763 German; S00764 French; S00842 Russian

ECTS credits: 5 **Weekly classes:** 0l+0s+0lab+4pr
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Foreign Languages, Faculty of Mechanical & Manufacturing Engineering
Lecturers:
Snr Lecturer Elitsa Georgieva, PhD, Dept. of Foreign Languages, tel.:+359 82 888 532;
E-mail: edgeorgieva@uni-ruse.bg
Snr Lecturer Diana Stefanova, Phd, Dept of Foreign Languages tel.:+359 82 888 532,
E-mail: dstefanova@uni-ruse.bg
Abstract:
The foreign language module 2 is also aimed at achieving communicative competence in the area of the subject specialism and the future job. The teaching objectives comprise the development of reading comprehension skills to handle specialist texts and the acquisition of communication skills to interact successfully in professional settings and everyday situations
Course content:
Higher education. Reading strategies. Note taking. Structure and organisation of a scientific text. Describing a process. Components and specifications. Describing graphs. Writing a CV. Announcements and messages (formal and informal). Enquiries, letters of complaint and orders. The grammar material is connected with the lexical topics and situations
Teaching and assessment:
To acquire the necessary language knowledge and to develop skills in using the language as a means of communication a wide range of authentic and specially constructed texts (i. e. articles, diagrams and tables, brochures, catalogues, manuals etc.) as well as audio , video, and multimedia materials are used. Students are offered lessons in computer laboratories, in which multimedia learning packages and on-line materials in Internet are used according to the modern trends in foreign language teaching. In class students participate in role-plays, pair and group activities and they are encouraged to work on their own on their translation assignment. Continuous assessment involves at least two written tests and oral testing as well.

S03035 Mathematics - 3

ECTS credits: 4 ***Weekly classes:*** 2l+0s+0lab+1pr
Assesment: exam **Type of exam**: written and oral
Departments involved:
Department of Numerical Methods and Statistics
Faculty of Social Health
Lecturers:
Prof. Velizar Todorov Pavlov, PhD, Dept of Numerical Methods and Statistics, tel.:+359 82 888 466,
E-mail: rk-pms@uni-ruse.bg
Assoc. Prof. Stefka Romanova Karakoleva, PhD,, Dept of Numerical Methods and Statistics, tel.:+359 82 888 606, E-mail: skarakoleva@uni-ruse.bg
Anotation:
The objective of the Cource on 3035 Mathematic 3 is to students knowledge and skills to solve engeneering problems requiring: Fourier serie; The most common numerical methods of linear algebra and mathematical analysis; Mathematikal apparatus of probability theory; The methods of mathematical statistics for processing experimental data.
Syllabus contents: Power serie, Fourier serie, Numerical methods for solving systems of linear equations, non-linear equations, systems of non-linear equations, least squares method for approximation of tabulated data. Elements of theory of probability, elements of mathematical statistics, element of regression and correlation analysis, main concepts of experiment planning.
Teaching and assessment:
The lecturers present the material theoretically and illustrate it with appropriate example problems. The half of each lecture consists of solving problems on material of the previous lecture. At the workshops application examples are solved with the aid of the programming environment MATLAB and namely: numerical method of algebra nad analysis, mathematical statistics. Two control works, 2 hours each, are conducted during the semester. The final mark is formed from written and oral exams, bearing in mind the results from the control works.

SB17665 Theory of Electrical Engineering - 2

ECTS credits: 5
Weekly classes: 2l+0s+1lab+0pr+1ca
Assessment: examination
Type of exam: written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept. of AE; tel.: +359 82 888 668, E-mail: msp@uni-ruse.bg
Abstract
The course Theoretic Electrical Engineering 2 familiarizes the students with the main methods for analysis of transient modes in linear electric chains and with the main methods for analysis of settled and transient processes in a chain with distributed parameters and in non-linear electric chains.
Course content:
Transient processes in linear electric chains - introduction; classical method; operator method метод; frequency method; transient quantities, Duamelle integral; method with state variables. Chains with distributed parameters - main concepts; differential equations of a homogeneous line; settled sine process in a homogeneous line, input impedance; line with no losses, standing waves. Non-linear electric chains - constant modes, main laws and methods for analysis; periodic modes, electric chains inertia and non-inertia non-linear elements, analysis methods; resonance phenomena; transient processes, methods.
Teaching and assessment:
At the beginning of the semester each student is given and individual problem as a course work. It should be presented at the end of semester in a written form and is defended orally.
The final assessment is done at the examination (written and oral), which consists of solving problems and answering questions.

SB17666 Electrical Measurements

ECTS credits: 5
Weekly classes: 2l+0s+2lab+0pr
Assessment: continuous assessment
Type of exam: written and oral
Methodology management:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.: +359 82 888 741, E-mail: skadirova@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract
“Electrical Measurements” course has the aim to make the students familiar with the basic methods and devices for electrical and non-electrical quantities evaluating as well as the metrical appraisals and results calculating. Another aim is students to acquire skills and habits which might be needed in measurement schemes realizing and to solve particular problems as well as in students’ activities as forth coming experts – electrical engineers.
The module is based on the knowledge acquired in Physics, Mathematics, and Mechanics lessons and especially in Theoretical Electrical Engineering.
The knowledge and skills acquired on this module are needed for the students to perceive the particular modules during the tutorials for metrical design ensuring of the technologic and production processes.
Course content:
Quantitative analysis and quantitative methods; Identification of a measuring method;Identification of a calculating method; A quality of the quantitative appraisals; Electrical and magnetic quantities; Assigning values to the electrical and magnetic quantities; Electrical quantities measuring by immediate comparison; Electrical quantities by mediate comparison; Digital electro-measuring appliances; Appliances for registration and observation; Electrical quantities calculating; Quantitative analysis of non-electrical quantities by electrical methods and devices; System for ensuring the unity of the measurements.
Teaching and assessment:
The process of the education on “Electrical Measurements” module consists of lectures and tutorials. Lantern-slides and experimental models might be used as guides.
Normally the tutorials are carried out into cycles. There are four places of work at the hall where on the average three students work together on each of it. The duration of each tutorial is three hours and at the end the students have to prepare a report. The all semester long marking is realized by testing at the time when the tutors are in progress and by periodical test control. The education completes with an exam at the end of fourth semester. Individual tutorials are carried out regularly at previously announced time for this purpose.

SB17671 Signals and Systems

ECTS credits: 6
Workload per week: 2l + 0s + 0lab + 2p + 1ca
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Snezhinka Lyubomirova Zaharieva, PhD, Dept. of AE, tel.: +359 82 888 382
E-mail: szaharieva@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772
E-mail: yneikov@uni-ruse.bg
Abstract:
The compulsory subject “Signals and Systems” has the objective to acquaint the students with the main principles in the creating, processing and transferring of the electrical signals for the needs of the communications, informatics and automatics. The knowledge of Physics is prerequisited.
Course content:
General report about the information theory. Electrical signals - types, main characteristics. Spectral analysis of periodic signals and non-periodic signals. Correlation analysis. Discreteness. Linear conversions of the signals. Input and output immittance of a quadripole. Analog and digital filtration. Modulation and demodulation. Coding. Signal conversions. Course assignment - harmonic analysis of periodic and non-periodic signals. Application of the theorem of Naikuist - Kotelnikov. The subject contains a course assignment
Teaching and assessment:
The lectures have two hours duration and are given according to the following scheme: the first week one lecture with two hours duration, the second week two lectures with two hours duration.
The exercises are done frontally. Manual calculations, study via computer analysis and laboratory measurements are done during the exercises. The students prepare a report for each exercise. The course assignment is done by the students on their own. It helps for the consolidation of the knowledges for harmonic analysis of periodic and non-periodic signals and the application of the theorem of Naikuist - Kotelnikov.

SB17672 Semiconductor Devices

ECTS credits: 5
Weekly classes: 2l + 0s +2lab+ 0pr
Assessment: exam
Type of exam: written
Departments involved:
Department of AE
Faculty of Electrical Engineering Electronics and Automation
Lecturers:
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.: + 359 82 888 741,
E-mail: skadirova@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, MEng, PhD, Dept. of AE, tel.: +359 82 888 772
E-mail: yneikov@uni-ruse.bg
Abstract:
The aim of the Semiconductor Devices course is to provide the students with the necessary knowledge of the structure, principle of operation, characteristics and the application areas of the most popular semiconductor devices (diodes, bipolar and field-effect transistors, optical device), as well as with skills for their practical use for the development of electronics products. A prerequisite is Physics.
Course content:
Fundamentals of the Physics of Semiconductors. p-n Junction and Metal – Semiconductor Contact. Semiconductor Diodes. The Bipolar Transistors. The Thyristors. The Junction Field-Effect Transistor (JFET). Metal-Oxide-Semiconductor Field-Effect Transistor (MOS FET). Optical Devices. Photovoltaic Devices. Active Matrix Flat-Panel Display (AMLCD).
Teaching and assessment:
The lectures are 2 hours each week. They are interactive with the use of multimedia. The laboratory exercises are 4 hours every second week and the whole group works on the same topic. A test is carried out in the beginning of each laboratory exercise. The test is graded on a scale from 0÷5 points. The students submit a report for each laboratory exercise to the course instructor. The additional requirements are according the Internal AcademicRegulations. Finishing course procedure is a written exam in the form of a test with 120 minutes duration. The test is graded on a scale from 0÷100 points. Final assessment is based: 20% on laboratory assignments and 80% on the final test.

S03191 Mechanical Engineering

ECTS credits: 5 **Weekly classes:** 2l+ 0s+0lab+2pr
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved:
Department of Machine Science, Machine Elements and Engineering Graphics
Faculty of Transport
Lecturers:
Assoc. Prof. Vasko Iliev Dobrev, Department of Machine Science, Machine Elements and Engineering Graphics, Phones: + 359 82 888 493, 888 735, + 359 82 888 722, E-mail: vdobrev@uni-ruse.bg
Abstract:
The course acquainted the students with the main tasks related to study of the mechanisms, machines and machines elements. It provides students with the basic idea of what the machine sciences are about, in order to realize a professional dialog and cooperation in mixed teams of electronics and machine specialists. A prerequisite are Mathematics, Physics, and Technical documentation.
Course content:
Structure and classification of mechanisms. Lever, gear and cam mechanism. Power analysis and mechanical efficiency coefficient. Balancing of mechanisms. Strength of the mechanical elements. Joints. Rotating elements. Mechanical gears.
Teaching and assessment:
The teaching material is presented in a logical manner and is illustrated with moving models of the mechanisms and machines. The lectures' themes are learned during the laboratory exercises via the use of the kinematic models, models of real mechanisms and mechanical elements and other experimental equipment. The preparation of the students during the semester is controlled during the labs via tests and assignments. The assessment is continuous or exam if the student fails on the continuous assessment.

SB17673 Analog Devices - 1

ECTS credits: 8 **Workload per week:** 3l+0s+0lab+3pr+1ca
Assessment: exam **Type of exam:** written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof Aneliya Vladimirova Manukova, DSc, Dept. of AE, tel.:+359 82 888 404, E-mail: amanukova@uni-ruse.bg
Abstract:
The compulsory subject gives the students the necessary minimum of knowledges in analog devices. It discusses the factors and methods for the realization of the most often used low-level and power amplifiers and generator stages in a discrete and integral input, methods for dc and ac analysis of the discussed circuits, as well as instructions for their design are used.
Course content:
General information about the amplifying engineering; main characteristics and operation modes. Back-coupling in the amplifiers; influence of the negative back-coupling on the main values of the amplifiers. Resistance of the amplifiers. Aperiodic amplifiers of small signals with a common emitter, common base and common collector by middle, low and high frequencies. Cascade circuits. Aperiodic amplifiers of power. Main elements from the analog devices of the analog integrated circuits. Differential amplifiers. Direct current amplifiers. Operational amplifiers - general characteristics and main circuits. The subject contains a course work. Amplifiers for special purposes. RC and LC oscillator.
Teaching and assessment:
3 hours lecture, 3 hours exercises carried out in two stages: analysis, design and measurement of the discussed device and/or computer analysis. Course assignment is involved. The continuous assessment during the exercises is done by oral discussions, checking of the home works and presentations of the course projects. Method of assessment: two hours written examination -70 %; current control – 20% and course work - 10 %.

SB17674 Theory of Control Engineering

ECTS credits: 8 **Weekly classes:** 3lec + 0sem + 0lab+ 1pr + 1ca
Assessment: exam **Type of exam:** written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturer:
Assoc. Prof. Donka Ilieva Ivanova, PhD, Dept. of AE, tel.:+359 82 888 266, E-mail: divanova@uni-ruse.bg
Principal Assistant Martin Deyanov, PhD, Dept. of AE, tel.: 082 / 888 747, E-mail: mdejanov@uni-ruse.bg
Abstract:
The course aims are to give knowledge and practical skills for modelling, analysis and synthesis of linear continuous-time control systems. Prerequisites to this course are the Mathematics and Signal Processing courses. The acquired knowledge has application in various fields of engineering. It is a basis for a number of courses in the speciality.
Course content:
Control systems: basic concept and definitions, classifications. Control systems design process. Mathematical models of linear continuous-time control systems: differential equations, transfer functions, block diagrams. Time-domain and frequency-domain characteristics. Stability analysis. Steady-state errors. Dynamic performance analysis. P, PI, PD and PID controllers. Digital controllers. Control systems design methods.
Teaching and assessment:
The lectures present the theoretic aspects of the addressed problems and illustrate them with appropriate examples. The aim of the practical exercises and the course work is to teach the students to apply the acquired knowledge creatively. They are conducted with the aid of MATLAB software system. The students' progress is checked in each exercise throughout the semester. A different topic for the course work is assigned to each student. The course ends with a written exam which consists of problem solving and question answering. In order to be allowed to take the exam the students have to attend all the exercises as well as to write a course work. The practical work mark and the course work mark are both taken into consideration when forming the final course mark.

SB17675 Electromechanical Devices

ECTS credits: 8 **Weekly classes:** 2lec + 0s + 0lab+ 3pr + 2ca
Assessment: exam **Type of exam:** written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept. of AE; tel.: +359 82 888 668,
E-mail: msp@uni-ruse.bg
Principal Assistant Nikolay Petkov Valov, PhD, Dept. of AE, tel.:+359 82 888 266; E-mail: npvalov@uni-ruse.bg
Abstract:
In the "Electromechanical units", students study basics of low voltage apparatus, contactors, motor protection, motors, electrical drives (DC and AC), as well as the means and methods of automation. It is note of power engineering in electrical drive, as well as selection of electric motor. Basic reference: "Electrical engineering-1", "Electrical measurements", " Electrical engineering-2", "Automatics". Initial reference: "Control of electromechanical systems – 1", "Control of electromechanical systems-2" "Graduation work.
Course content:
Basic of electric engineering. Low voltage apparatus. Transformers. DC electric machines, AC electric machines. Single and special machines.
Teaching and assessment:
The basic forms of training are the auditory and the independent students' work. Auditory work includes lectures and laboratory practice. It is used industrial models, electrical drive, and particularly developed trial-pieces in the laboratory practice. Classes are visualized with prospectus and company literature. Laboratory practice is conducted in cycle. Attestation is given when all the lessons are being attended to. Final mark forms from the written exam's result and the laboratory participation. There is an oral testing if needed.

S03196 Computer Organization

ECTS credits: 5 **Weekly classes:** 2l+1s+0lab+1pr+1ca
Assessment: exam **Type of exam:** written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturer:
Assoc. Prof. Aneliya Stoyanova Ivanova, MEng, PhD, Dept.of CST, tel.: +359 82 888 827,
E-mail: AIvanova@uni-ruse.bg
Abstract:
The objective of the Computer organization course is to familiarize the students with the arithmetic and algorithmic fundamentals of computer circuitry and most of all - with the structure and way of operation of the CPU. The following topics are considered in details: basic building blocks of the processor, structure and way of operation of Arithmetic and Logic Unit, Control Unit, registers, stack, cache, RAM, interrupt system. The organization of computational process is considered, too. Digital signal processors are discussed, as well as the fundamental computer peripherals.
Course content:
Arithmetic basis – counting systems, arithmetic computations, presentation and coding of numerical, symbolic and logical data. CPU - definition, classification, basic building blocks. Structure of the arithmetic and logic unit. Structure of the control unit. Memory structure – registers, stack, cache, RAM. Structure of the interrupt system. Organization of the computational process. Digital signal processors.Computer peripherals.
Teaching and assessment:
At the lectures the students are familiarized in a theoretic aspect with the methods and algorithms for execution of various operations in computer. At the seminars the structure and way of operation of different CPU units and operational blocks are discussed. At the workshops, the students explore the discussed algorithms using interactive software simulators of the basic CPU units and operational blocks. The students take the role of the control unit and set the necessary control signals by clicking the corresponding buttons. During the lectures and workshops the learning content is delivered using modern presentation systems with interactive whiteboards. The course assignment is developed in the virtual laboratory on Computer Organization.

SB16086 Economics

ECTS credits: 4 **Weekly classes:** 2l+1s+0lab+0pr+1ca
Assessment: continuous assessment **Type of exam:** coursework
Department involved:
Department of Economics
Faculty of Business and Management
Lecturers:
Assoc. Prof. Nataliya Todorova Nedelcheva, MSc, PhD, Ph.D., Dept. of Economics, tel.: + 359 82 888 851,
E-mail: nnedelcheva@uni-ruse.bg
Abstract:
Economics is a fundamental economic discipline that examines the general principles and problems of contemporary market economy at micro- and macro level. Thus, it gives knowledge of the economic system, the alphabet and grammar of economic language, and as a basis for the rest economic disciplines, it develops the economic culture that finds expression in skills for correct orientation and independent choice in the market environment.
Course content:
Introduction - Economic System and Fundamental Economic Theory. Basic questions towards every economy. Market Mechanism. Public Sector and Tax System. Demand and Supply at the Individual Markets. Consumer Demand and Behaviour. Production, Costs, and Revenues of the Company. Imperfect Competition and Supply. Pricing of Production Factors. Gross Domestic Product and Economic Growth. Economic Cycle, Unemployment, and Inflation. Macroeconomic Equilibrium. Fiscal Policy. Monetary Policy. Foreign Economic Policy in the Open Economy.
Teaching and assessment:
The lectures present the logic of the discipline principles and illustrate it by appropriate examples of the economic reality in Bulgaria. The seminars are based on the lectures and synchronized with their consistency. There are two continuous assessments in test form during the seminars. The active form of the tuition in Economics is an assignment which is submitted in the first week of the course during the seminars and represents a particular problem of Microeconomics or Macroeconomics that must be elaborated in written mode. The final assessment of the student is calculated as average arithmetic sum of the results of the two continuous assessments and the assignment.

S03198 Digital Devices

ECTS credits: 10
Weekly workload: 3l+0s+0lab+3p+2ca
Assessment: exam
Type of exam: written test
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, PhD; Dept. of Telecommunications; tel.: +359 82 888 823;
E-mail: nina@uni-ruse.bg
Assoc. Prof. Adriana Naydenova Borodzhieva, PhD; Dept. of Telecommunications;
tel.: +359 82 888 734; E-mail: aborodzhieva@uni-ruse.bg
Abstract:
The subject has the objective to familiarize students with the main problems of digital electronics. It links the functions of the digital elements with their microelectronic basis on one hand, and on the other hand – with their application when building pulse and digital devices. Deep knowledge in electrical engineering and semiconductors is necessary. The subject helps to give knowledge in the field of hardware.
Course content:
Boolean algebra. Synthesis and analysis of combinational circuits. Digital circuits with memory. Forming circuits. TTL integrated circuits. CMOS logic integrated circuits. Triggers. Schmidt triggers. Multi-vibrators. Generators of linear voltage. Impulse circuits with operating amplifiers. Particularities of integrated circuits with middle scale of integration. Interface circuits.
Teaching and assessment:
The lectures give the students the opportunity to get acquainted theoretically with the main questions of digital electronics before the laboratory exercises. The students must be prepared for each workshop and at the end prepare a report for each of them. The exam is held as a written test.

SB17677 Analog Devices - 2

ECTS credits:5
Weekly classes: 2l+0s+0lab+2pr
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Aneliya Vladimirova Manukova, DSc, Dept. of AE, tel.: +359 82 888 404, E-mail: amanukova@uni-ruse.bg
Abstract:
The subject has the objective to acquaint the students with the methods of analysis and design of receiver-amplifier systems with a large dynamic range, low basic noise and slight non-linear distortions and analog integrated circuits with a relatively high degree of integration and special purpose. The knowledge of Analog devices 1 is a course prerequisite.
Course content:
Basic noises in the bipolar and field transistors and operational amplifiers; methods for minimization. Ways for noise penetration in the receiver-amplifier systems and methods for overcoming them. Amplifiers with slight intermodulating distortions, determined according to the two-signal method. Main parameters, structure and application of analog integrated circuits with special purpose; analog multipliers-dividers, modulators, mixers, circuits for phase automatic maintaining of the frequency, etc. Design of analog devices with special integrated circuits and/or discrete elements.
Teaching and assessment:
Lectures are of a duration of two hours. The exercises last four hours every other week and are carried out in two stages: analysis design and measurement of the discussed device, and/or computer analysis. For creating skills for self-study homework is given periodically.

SB17678 Power Supply Devices

ECTS credits: 6
Weekly classes: 2l + 0s + 0lab + 2p + 1ca
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Aneliya Vladimirova Manukova, DSc, Dept. of AE, tel.: +359 82 888 404, E-mail: amanukova@uni-ruse.bg
Assoc. Prof. Snezhinka Lyubomirova Zaharieva, PhD, Dept. of AE, tel.: +359 82 888 382,
E-mail: szaharieva@uni-ruse.bg
Abstract:
The compulsory subject “Power Supply devices” has the objective to acquaint the students with the contemporary methods of circuit design and operation of wide range of electrical rectifying devices. The knowledge in “Analog Circuit Design”, “Signals and Systems”, “Theory of Electrical Engineering” and other are prerequisite.
Course content:
General characteristics of rectifying devices. Uncontrolled rectifiers, working by active, inductive-active and inductive-capacitive character of the load. Rectifying circuits with voltage multiplying. Smoothing filters. Circuits for regulating the output direct voltage. Rectifiers with controllable elements. Circuits for rectifier regulation. Direct voltage and current stabilizers. Parametrical and compensational direct voltage stabilizers.
Teaching and assessment:
The topics of the lecture material give possibility to the students to get acquainted theoretically with the main questions, methods and operation principles of the rectifying devices. During the practical exercises measurements, analyses and evaluation of the performance and qualities of investigated circuits are made. The practical exercises with 2 hours duration are done frontally with lectures. The methodological preparation is made in practical exercises, while the self-dependent work consists of course task. The method of assessment is a written and oral examination.

SB17679 Theory of Electronic Circuits

ECTS credits: 6
Weekly classes: 2l+0s+0lab+2pr+1ca
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Aneliya Vladimirova Manukova, DSc, Dept. of AE, tel.: +359 82 888 404, E-mail: amanukova@uni-ruse.bg
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.: +359 82 888 741, E-mail: skadirova@uni-ruse.bg
Abstract:
The Theory of Electronic Circuits course has the objective to acquaint the students with the modern methods for analysis, synthesis and optimization of a wide range of linear and non-linear electronic circuits. The laboratory exercises consolidate the knowledge acquired during the course of lectures and give practical skills for work with specialized software applications for analysis and synthesis of electronic circuits. The course assignment helps to form the necessary skills for independent work. The knowledge of Analog devices and Theory of electrical engineering are course prerequisites.
Course content:
Types of electronic components and circuits. Method of the equivalent circuits. Matrix methods for analysis. Topological methods for analysis. Amplifying circuits OE, OB, OC and their secondary parameters by low frequency - comparative analysis. Circuits with field transistors. Back-couplings. Stability. Circuits with operational amplifiers. Simulation of differential equations with OY. Hybrid circuits with OY. Filter theory. Butterward’s filters, Chebishev’s filters. Synthesis and realisation of active filters with one-loop and multiloop connection. Sensitivity of the electronic circuits.
Teaching and assessment:
Computers and specialized apparatuses are used during the exercises. The exam is written.

S03202 Optoelectronics

ECTS credits: 3 **Weekly classes:** 1l+0s+0lab+1pr+ca
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Physics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Petko Hristov Mashkov, MSc, PhD, Dept. of Physics, tel.: +359 82 888 219,
E-mail: pmashkov@uni-ruse.bg
Assist. Prof. Rostislav Kandilarov, PhD, Dept. of Physics, tel: 082 888 583; E-mail: rkandilarov@uni-ruse.bg
Abstract:
The course aims at familiarising the students with complex theoretical, methodological and apparatus problems in resent coherent and incoherent optoelectronics, at introducing the students into different application areas of optoelectronics devices and systems.
The laboratory exercises aim at creating skills for experimental investigation of optoelectronics phenomena and solving of practical problems.
Course content:
Basic properties and characteristics of optical radiation; incoherent optoelectronics; optical sources, photoreceivers; optrons; integrated optoelectronics; coherent optoelectronics: light amplification and generation, types of coherent light sources (lasers), comparison of their characteristics, laser emission control, coherent light propagation through the atmosphere and in optical waveguides; main application areas of optoelectronics and laser systems and devices in industry. The course focuses on elemental composition and working principles of optoelectronics devices, their basic parameters and specific application areas.
Teaching and assessment:
Lectures give the main theoretical material, supported by some demonstrations of optoelectronics phenomena and processes. At the laboratory exercises the student works independently and investigates particular optoelectronics phenomena, optoelectronics elements, devices and systems. The knowledge of lecture material and laboratory exercises is tested regularly. During the semester the students have two test papers. The final mark is formed after a discussion with the student.

SB17680 Measurement in Electronics

ECTS credits: 6 **Weekly classes:** 2l+0s+0lab+2pr+0,5rep.
Assessment: exam **Type of exam:** written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Snezhinka Lyubomirova Zaharieva, PhD, Dept. of AE, tel.: +359 82 888 382,
E-mail: szaharieva@uni-ruse.bg
Abstract:
The subject aims to acquaint the students with the main methods and electronic devices for the measurement of the parameters and the characteristics of electrical signals, and passive bipolar measurement. The new generation of electronic measurement apparatuses with microprocessor operation and their connection with automatic systems for research and production control is discussed, too. Course prerequisites include knowledge of Electrical measurements, Semiconductor components, Analog devices and Digital devices.
Course content:
Main characteristics of the measurements in electronics. Generating of electrical signals. Devices for observation and registration of the form of the electrical signals. Curves in the reproduction of oscillograms. Analog and digital measurement of voltage, current and power. Methods and equipment for measuring of frequency-temporary parameters. Measurement of non-linear curves, spectrum analysis and measurement of the parameters of modulated signals. Bipolar measurement. Programmed measurement devices for automation of the electronic measurements.
Teaching and assessment:
The topics of the lectures allow the students to become theoretically acquainted with the main issues of electronic measurements and to choose the methods and methodologies of measurement according to the given accuracy. The exercises are done in cycles. The students must be theoretically prepared for the exercises and for the tasks that they must accomplish during the exercise as well as for their practical implementation.
The exam is both written and oral on 2 questions from the course prospectus with a duration of 2 hours.

S03204 Microprocessor Devices

ECTS credits: 6 **Weekly workload:** 2 l + 0 s + 0 lab + 2 pr
Assessment: exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, MEng, PhD; Dept. of Telecommunications; tel.: +359 82 888 823;
E-mail: nina@uni-ruse.bg
Principle Lecturer Ivanka Dimitrova Tsvetkova, PhD, MEng; Dept. of Telecommunications;
tel.: +359 82 888 836; E-mail: itsvetkova@uni-ruse.bg
Abstract:
The subject Microprocessor Devices has the objective to acquaint the students with the characteristics, organization, functioning and usage of the microprocessors and microcomputers systems. The subject is based on the PIC18FXX2 single chip microcontroller and the MPLAB development environment.
Course content:
Microprocessor's architecture. Microprocessor system's architecture. Memory organization. Fundamentals and organization of the parallel interface, series interface and timers modules. ADC convertor.
Teaching and assessment:
The topics of the lectures give the possibility to the students to get acquainted theoretically with the main issues of the microprocessor devices before doing the practical exercises. Students develop and debug programs for exploring the components of the microprocessor system or the modules of the microcontroller using the available development environment.

SB17681 Design and Technology of Electronic Systems

ECTS credits: 6 **Weekly classes:** 2l+0s+0lab+2pr+1ca
Assessment: exam **Type of exam:** written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.: +359 82 888 741, E-mail: skadirova@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
The subject aims to acquaint the students with the modern methods, devices and element base for design of electronic systems and calculating their reliability. The requirements for exploitation of the designed systems and the modern engineering methods for analysis, synthesis and optimization of their parameters are discussed. Knowledge of Physics, Theory of Electrical Engineering and Semiconductor Devices are course prerequisites.
Course content:
Conditions for exploitation and classification of electronic systems. Reliability of electronic systems. Analysis of the accuracy in the design of electronic systems. General issues of the cooling of electronic systems. Electromagnetic rectifiers and commutators. Prevention of the electronic systems from factors causing instability. Element base used in the production of electronic systems. Constructional measurement and functional knots.
Teaching and assessment:
During the lectures the main issues included in the syllabus are discussed by focusing mainly on the physical gist of the processes. The exercises are connected with defining the characteristics of the electronic systems, measurement/calculation of the parameters and according to external factors. At the end of the semester the lecturer determines a mark based on the students' results from their participation in the exercises which influences the forming of the final assessment in this subject. The exam is a written and oral one on 2 questions from the course prospectus.

S03205 Conversion Technics

ECTS credits: 4 **Weekly workload:** 2l + 0s + 0lab + 1p
Assessment: exam **Type of exam:** written and oral
Department involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, PhD, PhD; Dept. of Telecommunications; tel.: +359 82 888 823;
E-mail: nina@uni-ruse.bg
Principal Assistant Ventsislav Petkov Keseev, PhD; Dept. of Telecommunications; tel.: +359 82 888 831;
E-mail: vkeseev@uni-ruse.bg
Abstract:
The aim of this mandatory course is to acquaint students with the common power electronic converters schemes, control circuits and methods for their designing. The course requires knowledge in the following fields: Mathematics, Theory of electrical engineering, Microelectronics and Power supply.
Course content:
Controlled rectifiers. Work with active and active-inductive loads. General characteristics of m-phase controlled rectifiers. Controlled rectifiers in inverting mode. Reversing rectifiers. Frequency converters with series connection. Alternating current regulators. DC - DC rectifiers. Autonomous inverters. Modulating of the output voltage of autonomous inverters. Electronic rectifiers control systems. The subject contains a course work.
Teaching and assessment:
The lecture topics teach students the theoretical foundations of power conversion techniques. The continuous assessment is done during the laboratory exercises and includes in-coming control, student assignments and assignment completion check. There are tutorials in connection with the lectures. After finishing the laboratory exercises the students prepare reports which are signed by the lecturer. Method of Assessment: exam and course work evaluation.

SB17682 Electronic Control Devices

ECTS credits: 5 **Weekly classes:** 2l+0s+0lab+2pr
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Aneliya Vladimirova Manukova, DSc, Dept. of AE, tel.:+359 82 888 404, E-mail: amanukova@uni-ruse.bg
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.: +359 82 888 741, E-mail: skadirova@uni-ruse.bg
Abstract:
The Electronic Control Devices course aims to acquaint the students with the devices and apparatuses for control and measurement with application in industry and in other branches of the economy. The laboratory exercises give practical skills for work with specialised devices and apparatuses. Course prerequisites include the knowledge of Electrical measurements as well as Analogue and Digital Devices.
Course content:
Classification of the electronic control devices. Types of primary transmitter elements. Measuring bridges and amplifiers. Generator circuits in the electronic devices. Automatic measurement devices with or without follow-up balancing. Digital meters for control and measurement and electromedical meters. Electronic devices for control of dimensions, levels and drifts. Electronic devices for control of temperature and humidity. Introduction to the industrial introscopia. X-rays. Application of the X-ray diagnostics in medicine. Introduction to the electrography. Parameters of the ecological control.
Teaching and assessment:
Computers and specialised apparatuses are used during the exercises. The students must be theoretically prepared for the exercises and must be computer literate.
Method of assessment: a written exam.

SB17683 Course Project in Analog Devices

ECTS credits: 3
Workload per week: 0 l + 0 s + 0 lab + 1 p
Assessment: official deference
Type of exam: oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Aneliya Vladimiriva Manukova, DSc, Dept. of AE, tel.: +359 82 888 404, E-mail: amanukova@uni-ruse.bg
Abstract:
The course project on the subject „Analog Devices" aims to consolidate the knowledge of the students from the Electronics course about the main issues of analog electronics and to create skills to apply the theoretical knowledge in practice in terms of synthesis, measurement and simulation/checking of the achieved quality indicators of electronic analog devices.
Course content:
Analysis and design of analog devices with integrated circuits with low and medium integration degree.
The explanatory notes of the course project contain all the calculations and the motivation for the choice of the components and the regimes of work. The graphical part includes a block and principle circuit and the results from a computer simulation everywhere, where possible (amplitude and phase frequency characteristics, time charts, etc.)
Teaching and assessment:
The students receive individual assignments, containing particular data for the required indicators. The project work is done according to a weekly timetable, which shows the interim stages of the design process. Always, whenever possible, the traditional calculations are done via computer simulation, and for separate cases – with development of a laboratory model. Apart from the regular classes, weekly individual tutorials are envisaged, as well.

SB17685 Automation of Design in Electronics

ECTS credits: 6
Workload per week: 2l+0s+0lab+2pr+1ca
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.: +359 82 888 741, E-mail: skadirova@uni-ruse.bg
Abstract:
The subject Automation of Design in Electronics has been included as a compulsory one in the syllabus of fourth year students of Electronics. It acquaints the students with the theoretical grounding, the structure of the programmes and their application for the automation of the design of electronic apparatuses with the help of electronic - computing devices. Course prerequisites include the knowledge of Mathematics, Analog devices and Theory of electronic devices.
Course content:
General characteristics of the automation of the design. Methods for machine analysis. Numerical methods for solving the equations of linear circuits and devices. Frequency analysis of electronic circuits. Stability of the electronic circuits. Non-linear direct current analysis of electronic circuits. Analysis of transition processes in electronic circuits. Tolerance analysis of electronic circuits and devices. Optimisation of electronic circuits and devices. Automatization of the design of constructive documentation. Automatization of the design of bare printed plates.
Teaching and assessment:
Lectures last 2 hours (the first week 2x2 hours, the next week 1x2 hours), an average of 3 hours per week. The exercises are of a duration of 4 hours and are conducted every other week. After each laboratory exercise the students prepare and present reports which are signed by the lecturer. The reports are used by the students during the exam. The continuous assessment is done during the exercises and includes pre-lab testing, giving assignments and checking their completion.

S03211 Industrial Controllers

ECTS credits: 6 **Weekly workload:** 2l + 0s + 0lab + 2pr + 0,5rep
Assessment: exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, PhD; Dept. of Telecommunications; tel.: +359 82 888 823;
E-mail: nina@uni-ruse.bg
Principal Assistant Ventsislav Petkov Keseev, PhD; Dept. of Telecommunications;
tel.: +359 82 888 831; E-mail: vkeseev@uni-ruse.bg
Abstract:
The subject has the objective to acquaint the students with the structure, means and ways for programming and the applications of the programmable logic controllers (PLC) as a universal technical device for industrial automation. The architecture and the programming tools of the modern PLC, produced by world-wide famous firms, are taught. The modern PLC programming languages according to the IEC 61131-3 standard are discussed.
Course content:
Industrial controllers - terminology. Activity of the programmable logic controllers. Architecture of the programmable logic controllers. Classification. Operational system. Information areas. Addressing modes. Programming languages according to the IEC 61131 standard. Structure of an applied program – a basic assignment and “fast assignments”. Automation control and GRAFSET programming languages. Specialized hardware and software for the PLC possibilities enhancement. Communications and communication modules. Input/output networks.
Teaching and assessment:
The topics of the lectures allow students to get acquainted theoretically with the main issues on the synthesis of control devices, based on PLC, before doing the practical exercises. Students develop and debug programs, configure PLC hardware and solve practical problems using the available development environment. The practical exercises are carried out in a specialized laboratory equipped with PLC, corresponding programming tools and laboratory setups.
Method of Assessment: 90 minutes written and oral examination, 1 question from the questionnaire and 1 problem solving task.

S03213 Course Project on Microprocessor Systems

ECTS credits: 2 **Weekly workload:** 0l + 0s + 0lab + 0p + 3cp
Assessment: defence **Type of exam:** oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, PhD; Dept. of Telecommunications; tel.: +359 82 888 823;
E-mail: nina@uni-ruse.bg
Abstract:
The course project on the subjects Microprocessor Systems consolidates the acquired knowledge and gives skills to the students for independent solving of engineering problems, connected with the design of different microprocessor systems, their repair and exploitation.
Course content:
Example topics, connected with the design of microprocessor devices based on single-chip microcomputers, are discussed. The project assignment includes hardware design (synthesis of the structure circuit and choice of the control processor; analysis of the work regimes) and software design (tasks division of the processor in the time as main routine and subroutines, interrupt service routines).
Teaching and assessment:
At the beginning of the term the students receive individual assignments, containing particular data for the required indicators. Weekly individual tutorials are envisaged. The explanatory notes of the project contain 20-30 pages with the following compulsory parts: hardware design, software design and arguments about the chosen structure, graphical part. The explanatory notes contain an assembler listing of the particular subroutine or interrupt service routine. The project is defended during the last week of the semester in front of the lecturer, who evaluates it with a complex mark, which is formed on the basis of the project’s development and presentation.

SB17686 Microelectronics

ECTS credits: 5
Weekly classes: 2l+0s+0lab+2pr
Assessment: exam
Type of exam: written
Methodology management:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Aneliya Vladimirova Manukova, DSc, Dept. of AE, tel.:+359 82 888 404, E-mail: amanukova@uni-ruse.bg
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.: +359 82 888 741,
E-mail: skadirova@uni-ruse.bg
Abstract:
The aim of the Microelectronics module is to provide the students with theoretical knowledge and practical skills of semiconductor components and integrated circuits (ICs) design and fabrication and use of computer software for technology and topology design. The knowledge of Physics and Semiconductor Components are prerequisite. The module provides the basis for the study of Microelectronic Circuits and Power Electronic Devices.
Course content:
Fabrication processes for semiconductor devices and integrated circuits: diffusion and ion implantation, epitaxy, oxidation, lithography, film deposition, assembly and packing. Basic bipolar, MOS and CMOS integrated circuits fabrication technologies. Design of active and passive components of bipolar integrated circuits. Design of MOS and CMOS integrated circuits. RAM and ROM memory cells. VLSI design. Hybrid integrated circuits.
Teaching and assessment:
Classical pedagogic methods are applied to the teaching process. Multi media and videos are used for some topics. The practical exercises follow the lectures and involve the use of the design software. During the practical exercises the students are divided into working groups of 2-3 students. Each group works on small projects, which are presented and evaluated by the teaching assistent. The additional requirements are according the Internal Academic Regulations. Finishing course procedure is a written exam in the form of a test with 120 minutes duration. The test is graded on a scale from 0÷100 points. Final assessment is based: 20% on laboratory assignments and 80% on the final test.

SB17687 Electronic Signal Converters

ECTS credits:6
Workload per week: 2l+0s+0lab+2pr+ca
Assessment exam
Type of exam: written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers*:*
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.: +359 82 888 741, E-mail: skadirova@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
The optional subject of Electronic Signal Converters aims to acquaint the students with the main methods and electronic devices for converting and processing of analog and digital signals. The static and dynamic errors of the electronic converters and the receiving of the real parameters are discussed, both of the analog and digital signals in the presence of distortions under the influence of noises or changes in the characteristics of the transfer media.
Course content:
Principles of the non-linear analog devices. Static and dynamic errors of the converters with following equalizing and methods for decreasing the dynamic errors. Converters with developing equalizing. Realization of non-linear functions, linearization, multifunctional devices, synthesis of digital filters and programming realization, digital filtration. The subject includes a course work.
Teaching and assessment:
The lectures enable the students to get acquainted theoretically with the contemporary methods for analyses and syntheses of the different non linear electronic devices and digital filters.
The lectures last two hours and follow an alternating schedule: the first week 2x2 hours, the second week 1x2 hours. The exercises last two hours, too. The continuous assessment on the subject is done during the seminars and includes an entry test, tasks for completion and their practical implementation and submission of the reports from the labs. Method of Assessment: Two hours of a written and oral exam, which includes 2 questions from the course prospectus.

SB17688 Embedded Systems

ECTS credits: 6
Weekly classes: 2l+0s+0lab+2pr+1ca
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Snezhinka Lyubomirova Zaharieva, PhD, Dept. of AE, tel.: +359 82 888 382,
E-mail: szaharieva@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
The optional course Embedded Systems aims to introduce students to the theory and different types of embedded systems. It studies the block diagrams, analysis and synthesis methods, programming principles, algorithms and modes of operation of different embedded systems and their building devices. The specific features of building blocks, sensors and actuators are considered.
Course content:
Application and metrics of embedded systems. Principle of embedded microcontroller control. Technological parameters of embedded systems. Embedded computer architectures.
Embedded operating systems. Characteristics, architecture and selection of embedded operating systems. Component-based embedded systems. Time-sensitive embedded systems. Architecture and parameters of time-sensitive embedded systems. System tools for real-time processing. Process scheduling.
Teaching and assessment:
Lectures are given for two hours each week. Practical exercises are conducted for two hours each week using the frontal method. Measurements and investigations are carried out on mock-ups performing various signal processing used in embedded systems. Independent study includes the development of a course assignment. The examination is written and lasts 1 hour by means of a test of 10 questions.

SB17689 Special and Power Semiconductor Components

ECTS credits: 2
Weekly workload: 1l + 0 s + 0 lab + 1p
Assessment: continuous assessment
Type of exam: written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.: +359 82 888 741,
E-mail: skadirova@uni-ruse.bg
Abstract:
The optional subject “Special and Power Semiconductor Components” has the objective to acquaint the students with c constructions, technology, operating of power and special semiconductor devices which are used in electronics .
The practical exercises aim at consolidating the knowledge from the lectures, analyzing and determining the main parameters of the analyzed items.
Course content:
Power diodes. Power and special thyristors. Power bipolar and field effect transistors. Insulated Gate Bipolar Transistor. Microwave semiconductor diodes and transistors. Solid State Relay. Housings, assembly and reliability of power semiconductors
Teaching and assessment:
The lectures enable the students to get acquainted theoretically with the main psysical principles of the power semiconductor devices. Practical exercises show real application of the mentioned devices, teach students to estimate basic parameters of the devices. The continuous assessment on the subject is done during the group works and includes entry test, tasks for completion and their practical realization and submission of the reports from the group works. The method of assessment includes written test, which is held at the end of the semester.

SB17690 Radio Communications

ECTS credits: 2 **Weekly classes:** 1l+0s+0lab+1pr
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Boris Ivanov Evstatiev, DSc, Dept. of AE, tel.: +359 82 888 371, E-mail: bevstatiev@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
The optional subject “Radio Communications” has the objective to acquaint the students with the theory and structure of the receiving and broadcasting equipment. The devices, the analysis and synthesis methods, the principles and operation regimes of the different receiving and broadcasting equipment are studied. The peculiarities of the active elements and of the units, determining the frequency, are discussed.
Course syllabus:
General information, main functions and structure circuits of the radio broadcasting devices. High frequency power amplifiers. Frequency multipliers. Electronic generators. Frequency synthesizers. Modulations in the radio broadcasting devices. Amplitude modulation. Frequency modulation devices. Phase modulation devices. Stereophonic frequency radio broadcasting. Radio receiving devices. Block circuits. Input devices of the radio receivers. High frequency amplifiers in the radio receiving devices. Medium frequency amplifiers in the radio receiving devices. Frequency converters in the radio receiving devices. Detection in the radio receiving devices. Amplitude detectors. Frequency demodulators. Regulations in the radio receiving devices. Stereophonic radio receivers. The subject contains a course work.
Teaching and learning methods:
Lectures are delivered with duration of an hour every week. The practical exercises are held once every two weeks and have two hours duration. The measurements are made on specially developed models – radio receivers and radio transmitters. The continuous assessment is formed by two written tests.

SB17691 Electronic Regulators

ECTS credits: 3 **Weekly classes:** 1l+0s+0lab+1pr+p
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept. of AE, tel.: +359 82 888 379,
E-mail: spenchev@uni-ruse.bg
Principal Assistant Nikolay Petkov Valov, PhD, Dept. of AE, tel.:+359 82 888 266; E-mail: npvalov@uni-ruse.bg
Abstract:
The Electronic regulators course aims to acquaint the students of Electronics with the principles and practical implementation of electronic regulators for operating of technological processes and objects. Apparatus devices and the algorithms for their functioning are discussed. Special attention is paid to the linear digital and the specialized local devices, and to the multichannel regulating devices, as well.
Course content:
Regulating devices – types. Main characteristics. Position regulators. Element knots and basic structure schemes of linear electronic regulators. Transitive processes, functional dependencies and back connections in the industrial regulators. Principle schemes of industrial regulators. Digital regulators. Formation of operational algorithms. Exthermal regulators. Main types. Regulators with alternating structure.
Teaching and assessment:
During the lectures the main topics of the study material are discussed.
Seminars are conducted in cycles and the students are divided into subgroups.
The students’ preparation is checked at the beginning of each practice session. The students prepare an individual report after a given model for each of the practice sessions.
Method of assessment: continuous assessment based on two tests.

SB17692 Audiosystems

ECTS credits: 3 **Weekly classes:** 1l+ 0s+0lab+ 1pr+ 0,5rep
Assessment: continuous assessment **Type of the exam:** written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Aneliya Vladimirova Manukova, DSc, Dept. of AE, tel.:+359 82 888 404, E-mail: amanukova@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel. +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
The course objective is to familiarize students with sound and sound field, rooms' acoustics, physiological acoustics, electroacoustical transformers, digital sound system's blocks, methods for analyzing of audio signals. Practical exercises include computer animations, acoustic demonstrations and electroacoustic measurements in connection with the lectures.
Course content:
Sound and sound field's characteristics. Physiological acoustics. Humans hearing properties. Room's acoustics. Electroacoustical transformers. Microphones, Loudspeakers. Sound systems, Audio-signals processing systems. Preamplifiers and sound mixers. Filters and equalizers, Parameters, Audiosystems' distortions. Analog to digital and digital to analog conversion of audio signals. Discrete Fourier Transform. Main functions and methods for audiosignals' design and analysis with Discrete Fourier Transform. Cepstral analysis of audiosignals. Digital audiosignal processing with DSP processors. Computer based audiosystems.
Teaching and assessment:
The lectures are going 2 hours per week during the winter term (seventieth) for fourth course students, specialty of Electronics. Most of the lectures are ready for a multimedia presentation. Lectures introduce the students with the theoretical aspects of the problems. Practical exercises are going 2 hours every second week. During the exercises the students learn electrical schemes, doing calculations or use a computer models (MATLAB). The students are prepared for each exercise using the literature recommendable by the teacher. The current control is carried out during the exercises. The current mark is based on the result of paperwork. During the term the students are given home works in a form of papers. The term of presentation depends on the topic of the paper.

SB17693 Microelectronic Circuits

ECTS credits: 5 **Weekly classes:** 3l + 0sem +0lab+ 0ps+3ca
Assessment: exam **Type of exam:** written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Prof. Aneliya Vladimirova Manukova, DSc, Dept. of AE, tel.:+359 82 888 404, E-mail: amanukova@uni-ruse.bg
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.: +359 82 888 741, E-mail: skadirova@uni-ruse.bg
Abstract:
The aim of the Microelectronic Circuits course is to provide students with knowledge and skills for circuit analysis and design of digital and analog integrated circuits, fabricated by bipolar, MOS or CMOS technology, as well as with the computer added design of integrated circuits. The course meets the unceasing interest in state-of –the-art technologies. The knowledge in Microelectronics are prerequisite.
Course content:
Basic principles of ICs design. Basic building blocks od ICs. Design of MOSFET digital circuits. Design of bipolar digital circuits. Design of bipolar, MOS, CMOS, BICMOS and JFET operational amplifiers. Applications and design of analog ICs. Mixed signal ICs.
Teaching and assessment:
The lectures are three hours each week. They are interactive with the use of multimedia. The practical exercises are three hours each week and follow the lectures. During the practical exercises the students are divided into working groups of 2-3 students. Each group works on small projects, which are presented and evaluated by the teaching assistent. The additional requirements are according the Internal Academic Regulations. Finishing course procedure is a written exam in the form of a test with 120 minutes duration. The test is graded on a scale from 0÷100 points. Final assessment is based: 20% on laboratory assignments and 80% on the final test.

SB17694 Electronic Security Systems

ECTS credits: 5 **Workload per week:** 3l +0s + 0 lab +3p
Assessment: examination **Type of exam:** written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Aneliya Vladimirova Manukova, DSc, Dept. of AE, tel.:+359 82 888 404, E-mail: amanukova@uni-ruse.bg
Assoc. Prof. Snezhinka Lyubomirova Zaharieva, PhD, Dept. of AE, tel.: +359 82 888 382,
E-mail: szaharieva@uni-ruse.bg
Abstract:
The compulsory course is students to gather theoretical knowledge about the basics, working methods and types of electronic security equipment and to obtain practical skills to use it. The main learning tasks are studying of specific components and devices used for alarm, security and protection of different objects and bringing in mind techniques for analysis and design of electronic security equipment.
Course content:
Introduction to the electronic security equipment. Distance operating security systems. Intrusion systems. Electronic Article Surveillance. Access control systems and devices. Biometric identification systems. TV monitoring control systems. Car alarm systems. Fire alarm electronic devices. Fire prevention electronic systems.
Teaching and assessment:
This subject is taught during the last semester the duration of which is 10 weeks. The lectures are 3 hours per week. Visual aids are used such as presentation boards, charts, diagrams, etc. The students regularly get consultations over the learning material. The practical exercises are 3 hours per week. They are conducted together with lecture material. The final mark is formed on the basis of the marks from the written exam.

SB17695 Self-training for diploma work

ECTS credits: 4 **Weekly classes:** 0l+0s+0lab+0pr
Assessment: oral exam **Type of exam:** oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
Self-training for diploma work concerns students, who don’t graduate with a state final examination, but make a diploma work. It aims at strengthening knowledge about important matter of analog and digital electronic circuitry, helping students from degree course of Electronics to form abilities for design and implementation of different microprocessor systems and to acquire skills for implementation of theory in practice. Gained theoretical and practical knowledge will be at hand in their future professional work as circuit designer and electronic engineers, as specialists and scientific researchers in professional field of Electrical engineering, electronics and automation.
Course content:
Analysis and design of particular electronic devices with discrete and integrated circuit elements with low and middle stage density level. Process simulation, schematic circuit and scale model design, statistical data processing and other experimental approaches for practical test of theoretical considerations.
Explanatory report of diploma work must consist of planning part, well-founded schematic part and full part of circuit design calculations. The graphical part contents structural and principal schematics of projected device and results from simulation analyses.
Teaching and assessment:
Students take and work on individual tasks, with personal initial data for required parameters. Weekly attendance has been accomplished by schedule with point on main internal project stages. Every time, when it is possible, calculations end with simulation analysis, but in some cases with prototype model elaboration. Besides regular weekly classes some individual tutorials are provided. Self-training work finishes in the last week of semester with oral exam.

SB11471 Specialized Microprocessor Systems

ECTS credits: 3 **Weekly workload:** 2l + 0s + 0lab + 2p
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, PhD; Dept. of Telecommunications; tel.: +359 82 888 823;
E-mail: nina@uni-ruse.bg
Principal Assistant Ventsislav Petkov Keseev, PhD; Dept. of Telecommunications; tel.: +359 82 888 831;
E-mail: vkeseev@uni-ruse.bg
Abstract:
The subject Specialized Microprocessor Systems has the objective to acquaint the students with the characteristics, organization, functioning and usage of special signal microprocessors. The practical exercises have the objective to create skills for experimental research and usage of the modern microprocessor devices and systems, as well as skills for using development environments for software design and debugging.
Course content:
Key features of the TMS320C54X DSP family. DSP architecture. Bus structure. Central Processing Unit. Memory organization. Data addressing. Program memory addressing. Pipelining. On-Chip Peripherals. Serial ports.On-chip peripherals.
Teaching and assessment:
The topics of the lectures give the possibility to the students to get acquainted theoretically with the main issues of the special microprocessor systems before doing the practical exercises. Students develop and debug programs for exploring the components of the microprocessor system using the available development environment. The practical exercises are carried out in a specialized laboratory equipped with the corresponding programming tools and laboratory models of the objects controlled. Two tests on the first and second part of the theoretical materials.

SB17696 Industrial Electronic Systems

ECTS credits: 3 **Weekly classes:** 2l + 0s + 0lab + 2pr
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Snezhinka Lyubomirova Zaharieva, PhD, Dept. of AE, tel.: +359 82 888 382,
E-mail: szaharieva@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
The elective course "Industrial Electronic Systems" is studied in the last semester of study and aims to introduce students to the theory and structure of different types of electronic control and automation systems in industry and industry. The lecture material covers research and principles used in industry for the operation and adjustment of selected electronic units to achieve process assurance, methods and means of processing transmitted and received signals, as well as actuators and their calibration.
Course content:
Industrial systems, installations and facilities. Structuring principles and identification designations. Basic rules and classification of objects and class codes. Safety of machinery. Building blocks and devices in industrial electronics. Electronic industrial control systems. Electronic machine vision systems. Industrial automation and machinery. Industrial robots. Measuring instruments and monitoring systems.
Teaching and assessment:
Lectures are given for two hours each week. Practical exercises are held for two hours each week. Measurements and set-up are carried out on industrial equipment in a simulated production environment. The final grade is formed by written examination and oral interview.

SB17697 Industrial Electronics

ECTS credits: 3 **Methods of Teaching :** 2l + 0s + 0lab + 2pr
Assessment: exam **Type of exam:** written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Aneliya Vladimirova Manukova, DSc, Dept. of AE, tel.:+359 82 888 404, E-mail: amanukova@uni-ruse.bg
Assoc. Prof. Snezhinka Lyubomirova Zaharieva, PhD, Dept. of AE, tel.: +359 82 888 382,
E-mail: szaharieva@uni-ruse.bg
Abstract:
The course has the objective to provide students from the stream “Industrial Electronics” of subject “Electronics” with extensive knowledge about the field of application of electronic circuits and devices in industry. The general principles /operating modes, electrical protections and power supply interactions/ are considered and special types of power electronic transducers from different branches of industry and transport are also given.
The theoretical exposition of the learning material is related to the knowledge acquired in subjects Analog schematic circuits, Transducing engineering, Current supplying devices, Pulse digital devices, etc.
Course content:
Balanced circuits of shunt and series type DC amplifiers and AC-DC converting amplifiers. Sine sources with separate and self-generated excitation. Pulse transducing devices. Line voltage generators. Rectifying circuits with voltage multiplying. Ripple smoothing filters. Power electrical transducers. Thyristor DC and AC breakers. Monophase and triphase thyristor AC breakers. Inverters. Monophase two-half-periodic dependent inverter. Triphase dependent inverter. Separate shunt and series type invertors. Series inverters with output frequency doubling. Many-stars series inverters. Regulation and stabilization of separate inverters’ output voltage. Pulse-width inverters.
Teaching and assessment:
The teaching is carried out by lectures and practical exercises. The main subjects of the lectures’ material gives opportunity students to acquire theoretically with the general principles in application of electronic circuits and devices in industry: The practical exercises have duration of 2 hours weekly according to the syllabus.
The final control is held by written and oral examination.

SB10677 Mobile Cellular Radio Networks

ECTS credits: 3 **Weekly workload:** 2l + 0s + 0lab + 2p
Assessment: continuous assessment **Type of exam:** written test
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Valentinov Hristov, PhD; Dept. of Telecommunications; tel.: +359 82 888 673;
E-mail: ghristov@uni-ruse.bg
Principal Lecturer Ivanka Dimitrova Tsvetkova, PhD; Dept. of Telecommunications, tel.: +359 82 888 836,
E -mail: itsvetkova@uni-ruse.bg
Abstract:
The course introduces the students with the basic standards, principles and technologies of the mobile cell radio networks. To take in concern the dynamical development of the networks, the heading of the researches for the next years is also specified. The course presents the digital systems and technologies for mobile communications including their architecture, interfaces and protocols, technologies, services and other.
Course content:
Introduction to MCRN: classification, general characteristics, principles of MCRN. Electromagnetic wave propagation in the MCRN channel. Signal attenuation. Signal propagation models in the MCRN radio channel. MCRN radio channel performance issues, MCRN cellular architecture. Clusterization. Cell division. MCRN access methods FDMA, TDMA, CDMA, OFDMA, MCRN signal processing and modulations, Channel coding, GSM networks. Structure and functionality of GSM networks, Radio interfaces, Security and channel characteristics, Next generation mobile cellular networks, GPRS - 2,5G; UMTS – 3G; LTE -4G.
Teaching and assessment:
The lectures are conducted 2 hours weekly, and the practical exercises are 2 hours. The students are preparing for the exercises, using the recommended literature. For each exercise the students prepare and present to the teacher a report. The grade for the discipline is determined by 2 tests done during the semester.

S03227 Bachelor Thesis

ECTS credits: 10 **Weekly classes**: 0л + 0су + 0лу + 0пу
Assessment: defense / exam **Type of exam:** oral / written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Consultants:
All lecturers from the Department of AE
Abstract:
The Bachelor thesis is an independent, creative task, which is performed under the supervision of a scientific advisor, and if necessary, a scientific consultant. The aim of the Bachelor thesis is to develop and demonstrate the students' ability to use the knowledge gained during their studies to solve the practical engineering tasks, related to their specialty, and to defend it in front of the examination board. The state examination is held in front of a State examination board and in accordance with an approved questionnaire that includes questions from all fundamental disciplines.
Course content:
The Bachelor thesis includes: title page; abstract; content; introduction; literature review and analysis of the existing solution; description of suggested solution; results, conclusions and discussion; references, and appendixes. Graphical part includes block and schematic diagrams, tables and graphs with the experimental results, the device prototype if it is a part of the task.
Teaching and assessment:
The department of Automatics and Electronics organizes collecting, approving and announcing of the suggested themes for Bachelor thesis, the distribution of the students per theme and scientific advisors, the diploma practice organization, the supervision, review and presentation of the Bachelor thesis.
Weekly tutorials with the scientific advisors are provided for the students during which is monitored the process of the fulfillment of the given assignment. The student defends its Bachelor thesis or holds its State examination in front of the State examination board.

UNDERGRADUATE STUDIES IN COMPUTER CONTROL AND AUTOMATION

PROFESSIONAL STANDARDS

OF A BACHELOR IN COMPUTER CONTROL AND AUTOMATION

SUBJECT: **COMPUTER CONTROL AND AUTOMATION**
Educational Degree: **Bachelor**
Professional Qualification: **Automatics Engineer**
Term of education: **4 years (8 terms)**

The main goal of training in a "**Computer control and automation**" is to prepare highly qualified, wide profiled specialists with solid general technical skills and enhanced knowledge of automatics and modern information and control systems. The specialty meets the specific needs in different fields like the industry, communications, transport, ecology, agriculture and follows the dynamics of their development.

1. General and special training.

- A Bachelor in "**Computer control and automation**" obtains basic engineer training in mathematics, physics, programming and computer applications, electrical engineering, electronics, microprocessors, electrical machines and devices, mechanics, economics.
- The special training includes obtaining thorough knowledge of control system engineering, process control automation system components and control of electromechanical systems. It is accented to the study of computer programming, control system modeling and simulation, application of computer control and measurement systems and modern approaches for signal and data processing, system identification and automation system design.

2. General and special skills.

A Bachelor in "**Computer control and automation**" obtains the general and special skills as:

- design of elements and systems for control and automation;
- implementation, adjustment and support of automation systems;
- programming, test and adjustment of computer control and measurement systems;
- use of advanced PC based technologies for data acquisition and signal processing;
- development and application of quality control systems;
- application of computer software MATLAB, LabView, and programming language C++.

3. Career opportunities.

The wide profiled qualification and the profound knowledge in the field of automatics, information and control systems gives the opportunity to the bachelor to successfully implements themselves in different areas of the economy in:

- firms and enterprises as designers and industrial engineers for automation;
- firms and enterprises with special measurement and control system departments, power sections, measurement and control system labs and quality control labs;
- small and medium enterprises as test and implementation engineers of automation systems;
- industrial enterprises as operators of automation systems;
- industrial enterprises as managing engineers of production workshops.

CURRICULUM
of the degree course in COMPUTER CONTROL AND AUTOMATION

Code	First term	ECTS	Code	Second term	ECTS
S02519	Mathematics 1	7	S00846	Mathematics 2	6
S02521	Physics 1	6	S01022	Physics 2	4
S02520	Programming and Computer Application 1	4	S01045	Programming and Computer Applications 2	5
SB17670	Teaching practice	3	SB17664	Theory of Electrical Engineering 1	5
S00133	Electrical Safety	2	S00411	Electrical Engineering Materials	5
	Electives				
S02522	Technical Documentation	5			
S00366	Computer Graphics				
	Electives			**Electives**	
S00424	English Language	3	S00761	English Language	5
S00523	German Language		S00763	German Language	
S00683	French Language		S00764	French Language	
S00760	Russian Language		S00842	Russian Language	
	Total for the term:	***30***		***Total for the term:***	***30***

Code	Third term	ECTS	Code	Fourth term	ECTS
S03035	Mathematics 3	4	S03150	Pulse and digital devices	5
SB17665	Theory of Electrical Engineering 2	5	SB17701	Analog Devices	4
SB17666	Electrical Measurements	5	SB17702	Control Theory 1	8
S03147	Engineering Mechanics	5	SB16086	Economics	3
SB17672	Semiconductor Devices	5	SB17703	Electromechanical Devices	6
SB17700	Data and signal processing	6		**Electives**	
			S03155	Specialized language	4
			SB16337	Marketing	
			SB16182	International Economics	
			SB16338	Company Management	
			S03156	Dynamics of Mechanical Systems	
			SB17676	Practice - 1	2
	Total for the term:	***30***		***Total for the term:***	***30***

Code	Fifth term	ECTS	Code	Sixth term	ECTS
SB17704	Control Theory 2	7	SB17709	Computer Control Systems	7
SB17705	Microprocessors	4	SB17710	System Identification	6
SB17706	Elements of automation systems	7	SB17711	Process Control	7
SB17707	Control of Electromechanical Systems	6	SB17712	Computer Control Systems – Project	4
	Electives			**Electives**	
SB17708	Sensor technology	6	SB17713	Control of electrical drive systems	6
SB10689	Elements and mechanisms in mechatronic systems		SB17714	System Drives in Mechatronics	
			SB17684	Practice - 2	3
	Total for the term:	***30***		***Total for the term:***	***30***

Code	*Seventh term*	*ECTS*	*Code*	*Eighth term*	*ECTS*
SB17715	Programmable logic controllers	7	SB17720	Digital Signal and Data Processing	5
SB17716	Industrial Communication Networks of Computer Control Systems	5	SB17721	Intelligent Systems and Sensors	5
SB17717	Process Control System Design	6	SB17722	Self-preparation for bachelor Thesis	4
	Electives			**Electives**	
SB17718 SB10695	CAD in electrical engineering CAD in mechatronics	7	SB17723 SB17724	Industrial Control Systems Interfacing	3
	Electives			**Electives**	
SB17719	Process Control System Design - Project	5	SB17725	Quality Control	3
SB10696	Design of Mechatronic Systems - Project		SB17726	Robotics	
			SB17727	State Examination	10
			SB17728	Bachelor Thesis	
	Total for the term:	***30***		***Total for the term:***	***30***

Total for the degree course: 240 ECTS credits

S02519 Higher Mathematics 1

ECTS credits: 7 **Weekly classes:** 2l + 2s + 0lab+ 0pr + 1ca
Assessment: Exam **Type of exam:** written
Departments involved:
Department of Mathematics
Faculty of Natural Sciences and Education
Lecturers:
Assoc. Prof. Yuriy Dimitrov Kandilarov, PhD, Dep. of Mathematics, tel. 888634, e-mail: ukandilarov@uni-ruse.bg
Assist. Prof. Anna Simeonova Lecheva, PhD, Dep. Of Mathematics, tel. 888453, e-mail: alecheva@uni-ruse.bg
Abstract:
HIGHER MATHEMATICS 1 is fundamental to engineering education and builds on the studies of Mathematics from secondary education. It is imperative to the students' education in other mathematical subjects as well as in Physics, Mechanics, Electrical engineering and a number of general engineering subjects. The course includes topics from Linear algebra and analytical geometry, Differential and integral calculus of function of a variable.
Course content:
Linear algebra – matrices, determinants, system of linear equations; Vector algebra – vector operations; Plane analytical geometry – line in plane; Differential calculus of function of a variable - derivative of function and applications; Integral calculus – basic integration techniques, integration of rational functions.
Teaching and assessment:
The students get acquainted via lectures with basic mathematical notions. By rule, the theorems do not include proofs but there are many examples and applications given. The seminars develop the students' technical ability for practical problem solving. Students are allowed to use formulas during classes, tests and exam. Students should prepare for the seminars by learning the course material and examples. The exam is considered passed only if the student has solved at least two problems. One of those problems should be chosen from the Linear algebra, Vector algebra and Analytical geometry sections. The other one should be chosen from the Differential and integral calculus of a function of a variable. The final mark is formed after a talk with the student.

S02521 Physics 1

ECTS credits: 6 **Weekly classes:** 2l + 0s + 2lab+ 0ps+ 0,5 cw
Assessment: Exam **Type of exam:** written, test
Departments involved:
Department of MMEEG and Physics
Faculty of Transport
Lecturers:
Assoc. Prof. Petko Hristov Mashkov, PhD, Dep. of MMEEGP, tel.:082 888 583, e-mail: pmashkov@uni-ruse.bg
Assist. Prof. Rostislav Kandilarov, PhD, Dept. of MMEEGP, tel: 082 888 583; E-mail: rkandilarov@uni-ruse.bg
Abstract:
The course aim is to introduce students to the physical character of processes and phenomena in nature and the methods of their investigation, with the most general properties of the matter and material objects. The laboratory exercises aim at creating skills for experimental investigation of physical phenomena.
Course content:
Measuring physical quantities. Mechanics of material point. Gravitation. Work and energy. Laws of conservation in mechanics. Oscillations & waves. Acoustics. Molecular physics and thermodynamics. Electric field and electric current. Magnetic field and magnetic forces.
Teaching and assessment:
Lectures give the main theoretical material, supported by some experimental and multimedia demonstrations of physical phenomena and processes. At the laboratory sessions the students work experimentally and investigate particular physical phenomena. During term students prepare a scholarly essay. Student knowledge of the theoretical material is tested regularly. The exam is in a form of test. The end mark depends on the results of the test, of the laboratory sessions and of the scholarly essay.

S02520 Programming and Computer Applications 1

ECTS credits: 4 **Weekly classes:** 2l + 0s + 0lab+ 2pr+0ca
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Informatics and Information Technologies (IIT)
Faculty of Natural Sciences and Education
Lecturers:
Prof. Tzvetomir Vassilev, PhD, Dept. of IIT, tel. 082 888 475, tvassilev@ami.uni-ruse.bg
Assist. Prof. Metodi Dimitrov, PhD – Dept. of IIT, tel. 082 888 470, mdimitrov@ami.uni-ruse.bg
Abstract:
The first part of the course aims at giving knowledge about the computer as a technical tool and the software products which make it a priceless assistant to specialists in all fields. The second part is an introduction to programming and aims at giving students skills to develop algorithms and computer programs with intermediate levels of difficulty. Significant attention is paid to algorithm development. The C++ programming language is used as a tool, which is widely spread and also used in later courses.
Course content:
A brief history of computers. Classification. CPU, main memory. Secondary storage. Input-Output devices. Computer networks. Operating systems. Word-processing, Spreadsheets and Databases. Algorithms. Introduction to C++. General structure of a program. Operations. Built-in functions. Expressions. Branches
Teaching and assessment:
The lectures are 2 hours per week. The workshops take place in computer labs and the students work on the above topics under the lecturer's supervision. At the end of each stage the practical skills of the students are tested. Students' knowledge on the first part of the course is examined using a computer test of 50 questions. Students also do control work on the second part of the lecture material.
The final grade is determined from the test mark, the continuous assessment at the workshops and the mark of the control work.

SB17670 Teaching practice

ECTS credits: 3 **Weekly classes:** 1l + 0s + 0lab+ 2pr
Assessment: colloquium **Type of exam:** test
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Tsvetelina Dimitrova Georgieva, PhD, Dept. of AE, tel. 082888668, e-mail: cgeorgieva@uni-ruse.bg
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept. of AE, tel. 082 888 379, E-mail: msp@uni-ruse.bg
Abstract:
The Teaching Practice course aims to give first-year students some introductory theoretical knowledge in the field of Electronics, Automation and Computing as well as to give beginners practical skills bearing in mind the different level from which the students start their studies at the university.
Course content:
Basic elements in electrical circuits, ways of connection. Notation of elements in electrical circuits. Types of electronic measuring devices, measuring units, measurement errors. Basic elements in the systems for automatic control. Technologies for producing printed circuit boards. CAD/CAM systems. Architecture and programming of programmable logic controllers.
Teaching and assessment:
The educational process is realized by lectures and practice work. The educational material is theoretically presented and demonstrated by proper example problems in the lectures. Lectures are delivered every week for the first eight weeks. In the workshops, the educational material understanding is controlled and skills for solving practical problems are developed. The workshops are conducted on a rotational principle in two specialized labs at the Departments of Automatics and Electronics.
The final mark is formed by colloquium. The exam test includes 15 problems and/or theoretical questions from the educational material, and one practical task to be solved.

S00133 Electrical Safety

ECTS credits: 2 **Weekly classes:** 1l + 0s + 0lab + 1pr + 0ca
Assessment: colloquium **Type of exam:** written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Ivaylo Stefanov Stoyanov, PhD, Dept. of EPE, tel.: 082888843, e-mail: stoyanov@uni-ruse.bg
Abstract:
The course Electrical Safety is designed for the students studying in the Bachelor of Science courses in Electrical engineering, Electronics and Automation & Mechatronics. It gives the students knowledge and skills regarding the basic principles, methods and technical means of providing electrical safety when working with electrical devices, appliances and installations. The taught material is being supplemented with examples and cases from the industry which helps the students gain the ability to make decisions.
Course content:
Basic terms and definitions of the protection of safety. Influences alternative and direct current of people. Parameters and limits value. Electric insulation. Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts – IK code and IP code. Safety of electric appliances for measurement, control, management, and laboratorial application. Safety of manual electric instruments. Electrostatics and methods for safety. Electrostatic sources. Electromagnetic compatibility of the devices. Climate and mechanical resistance to cold, dry heat, temperature changes, sudden temperature changes, corrosion atmosphere, vibrations, noise, changes of the air pressure, sun radiation, contaminating fluids and their combinations. Fire safety and explosion-proof safety in the electric equipment
Teaching and assessment:
The teaching is based on the usage of classical pedagogic forms. On some topics projecting materials and videos are shown. The practical exercises follow the lecture topics. Early passing of exam is not allowed. At the exam the students work on one question to estimate the degree of knowledge.

S02522 Technical Documentation

ECTS credits: 5 **Weekly classes:** 1l + 0s + 0lab+ 2pr+1ca
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Machine Science, Machine Elements, Engineering Graphics and Physics
Faculty of Transport
Lecturers:
Assoc. Prof. Vyarka Toncheva Ronkova, PhD, Dept. of MSMEEGP, tel.: 082888461,
e-mail: vronkova@uni-ruse.bg
Abstract:
The course "Technical documentation" teaches the methods for design, standard documents and rules for elaboration of design documents (drawings, schemes, text documents), notations when drawing specific parts of the electric industry, common assemblies in engineering, as well as the opportunities and tools for electronic documentation. At the workshops and while doing the course work the students acquire the skills of independent elaboration and comprehension of design documents per hand and with application of computers.
Course content:
Main characteristics and importance of the documentation of technical solutions. General requirements for the preparation of technical documents. Complexity of technical documentation. Part drawing. Assembly drawing. Text documents. Making drafts of items with electrical mounting, electrical schemes etc., rules for working out and reading. Symbols for expressing specific details from the electrical industry, Use of programming products for electrical drawings with application of computer.
Teaching and assessment:
The lectures present theoretical material that gives main knowledge on how to prepare technical documents. At the seminars students solve problems and prepare to participate in their course work under the guidance of the teacher. The course work is elaborated out of classes and is checked, corrected and marked by the lecturer. The final mark is formed from the results of the course work and two control works.

S00366 Computer application for Technical Documentation

ECTS credits: 5 **Weekly classes:** 1l + 0s + 0lab+ 2pr+1ca
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Machine Science, Machine Elements and Engineering Graphics and Physics
Faculty of Transport
Lecturers:
Assoc. Prof. Vyarka Toncheva Ronkova, PhD, Dept. of MSMEEGP, tel. 082888461,
e-mail: vronkova@ uni-ruse.bg
Abstract:
The course " Computer Graphics" has the objective to acquaint the students with the application of computers as a technical device and with the different kinds of application of programming products for special electrical drawing and schemes AutoCAD. At the workshops and while doing the course work the students acquire the skills of independent elaboration and comprehension of design documents with application of special programming products and computers.
Course content:
2-CAD Systems specifically programming products for electrical drawings. General requirements for the preparation of technical documents. Text documents, electrical schemes etc., rules for working out and reading. Complexity of the technical documentation. Symbols for expressing specific details from the electrical industry, Making draft symbols of electrical elements. Use of programming products for electrical drawings with application of computers.
Teaching and assessment:
The lectures present theoretical material that gives main knowledge on how to prepare technical documents with application of computer and special programming product for electrical drawings Microsoft Visio. At the workshops students solve problems and prepare to work on their course work. The workshops are done in labs equipped with personal computers and the practical work done under the leadership of a teacher on the above-mentioned topics. The course work is elaborated out of classes and is checked, corrected and marked by the lecturer in the classes for course work. The final mark is formed from the results of the course work and two control works.

Foreign Language I
S00424 English, S00523 German, S00683 French, S00760 Russian - part - 1

ECTS credits: 3 **Weekly classes:** 0l + 0s + 0lab+6ps
Assessment: Yes/No mark **Type of exam:** written
Departments involved:
Department of Foreign Languages,
Faculty of Mechanical & Manufacturing Engineering
Lecturers:
Snr Lecturer Diana Stefanova, PhD, Dep. of Foreign Languages, tel.: 082 888 532; dstefanova@uni-ruse.bg
Sr Lecturer Sergey Bartenev, Department of Foreign Languages; tel: 082 888 824, 230; sbartenev@uni-ruse.bg
Sr Lecturer Iliyana Benina, PhD, Department of Foreign Languages; tel: 082 888 815; ibenina@uni-ruse.bg
Abstract:
The foreign language module 1 is aimed at achieving communicative competence in the area of the subject specialism and the future job. The teaching objectives comprise the development of reading comprehension skills to handle specialist texts and the acquisition of communication skills to interact successfully in professional settings and everyday situations
Course content:
Meeting people. Places. Jobs. Festivals. Food and drink. Hobbies and interests. Transport. Health. The Internet.
Teaching and assessment:
The main form of teaching is practical exercises. It aims at developing the language skills of reading, writing, listening and speaking. A large variety of authentic and specially chosen texts (articles, charts, tables, brochures, catalogs, etc.), as well as audio and video materials, pair-work, group-work and discussions are used with the objective to develop skills for communicating in real situations. Different strategies for learning a foreign language are discussed and work both with traditional and electronic devices is recommended. The students are acquainted with the separate elements of the foreign language for academic purposes. The semester finishes with verification for regular attendance and a final written examination.

S00846 Higher Mathematics 2

ECTS credits: 6 **Weekly classes:** 2l+2s+0lab+0pr+0ps
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Mathematics,
Faculty of Natural Sciences and Education
Lecturers:
Assoc. Prof. Julia Chaparova, PhD, Dept. of Mathematics, tel. 082 888 226, e-mail: jchaparova@uni-ruse.bg
Assoc. Prof. Yuriy Kandilarov, PhD, Dept. of Mathematics, tel. 082 888 725, e-mail: ukandilarov@uni-ruse.bg
Abstract:
This subject is fundamental for mathematics education in engineering sciences. The goal is to get students acquainted with the basic notions of mathematical analysis, and give them practical computational abilities. Students can use the gained knowledge for further study of higher mathematics – part 3, physics, computer sciences.
Course content:
Definite and Line integrals, Partial derivatives, Differential Equations, Complex Functions, Laplace transform.
Teaching and assessment:
The educational process is realized by lectures and seminars. Lectures present the basic notions and methods for exploring the problems. There is a final written and oral exam at the end of the course.

S01022 Physics 2

ECTS credits: 4 **Weekly classes:** 2lec + 0sem + 1labs+ 0pr+ 0,5cw
Assessment: Exam **Type of exam:** written, test
Departments involved:
Department of MMEEG and Physics
Faculty of Transport
Lecturers:
Assoc. Prof. Petko Hristov Mashkov, PhD, Dep. of MMEEGP, tel. 082888218; e-mail: pmashkov@uni-ruse.bg
Assoc. Prof. Vladimir Mateev, MEng, PhD, Dept. of MMEEGP, tel: 888583; e-mail: vmateev@uni-ruse.bg
Abstract:
The course aim is to introduce students to the physical character of processes and phenomena in nature and the methods of their investigation, with the most general properties of the matter and material objects. The laboratory exercises aim at creating skills for experimental investigation of physical phenomena.
Course content:
Electromagnetic field. Wave, geometric & quantum optics. Elements of Semiconductor physics and of Atomic & Nuclear physics.
Teaching and assessment:
Lectures give the main theoretical material, supported by some experimental and multimedia demonstrations of physical phenomena and processes. At the laboratory sessions the students work experimentally and investigate particular physical phenomena. During term students prepare a scholarly essay. Student knowledge of the theoretical material is tested regularly. The exam is in the form of a test. The end mark depends on the results of the test, of the laboratory sessions and of the scholarly essay.

S01045 Programming and Computer Applications 2

ECTS credits: 5 **Weekly classes:** 1l + 0s + 0lab+ 1ws+1ca
Assessment: Exam **Type of exam:** written
Departments involved:
Department of IIT
Faculty of Natural Sciences and Education
Lecturers:
Prof. Tzvetomir Vassilev, PhD, Dept. of IIT, tel. 082 888 475, tvassilev@ami.uni-ruse.bg
Assist. Prof. Metodi Dimitrov, PhD, Dept. of IIT ,tel. 082 888 470, mdimitrov@ami.uni-ruse.bg
Abstract:
The course is a natural continuation of Programming and Computer Applications – part I. The lectures introduce the main data structures (arrays, strings, structures, files) and algorithms for their processing. The workshops aim at developing skills in the students to build algorithms and programs using such structures.
Course content:
Expressions. Branches. Functions. Sorting and binary array search. Strings. Structures. Files.
Teaching and assessment:
The lectures clarify the theoretical aspect of the topics and have a sufficient number of examples. This enables the students to prepare in advance for the workshops and to work independently during the classes. The workshops are held in computer labs. The students do practical work developing, testing and debugging programs. Every student is assigned an individual task, which he/she has to develop and present. The exam is written. It comprises problems that require developing a program and a theoretic question. The problems have several items with an increasing level of difficulty.

SB17664 Theory of Electrical Engineering 1

ECTS credits: 5 **Weekly classes:** 2l+ 2s + 0lab+ 0pr+0ca
Assessment: Exam **Type of exam:** written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Dr. Tsvetelina Georgieva; Dept. of AE; tel.+35982888668, e-mail: cgeorgieva@uni-ruse.bg
Abstract:
The course Theoretic Electrical Engineering 1 familiarizes the students with the bases of electromagnetism and with the main methods for analysis of settled modes in linear electric chains. The acquired knowledge is a basis for Electrical Engineering 2 and all electrical courses.
Course content:
Bases of the electromagnetism – main concepts; electro-magnetic field; electric current; electric voltage, electric potential, electric moving voltage; magnetic field; law of electro-magnetic induction; electric and magnetic energy; Maxwell's equations, scalar and vector potential; transforming the energy of electro-magnetic field, pointing theorem, transmitting energy over a two-wire line and transformer connection.
Settled modes in linear electric chains – main concepts and laws; constant modes in electric and magnetic chains; conversion, methods of analysis, principle and theorems for electric chains; sine modes and quantities, sine modes in serial and parallel RLC bi-pole, laws of Ohm and Kirhof in complex fashion, resonance phenomena; periodic non-sine modes; three-phase chains; quadrupoles.
Teaching and assessment:
Lectures present the teaching material according to the syllabus. At the seminar students solve problems covering the topics of the syllabus. The final assessment is accomplished via examination, conducted in a written and oral form.

S00411 Electrical Material Science

ECTS credits: 5 **Weekly classes:** 2l + 0s + 2lab + 0ps
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Ivaylo Stefanov Stoyanov, PhD, Dept. of EPE, tel. 082888843, e-mail: stoyanov@uni-ruse.bg.
Assoc. Prof. Ognyan Nikolaev Dinolov, PhD, Dept. of EPE, tel. 082888531, e-mail: odinolov@uni-rese.bg
Abstract:
In the developed course of lectures, the materials structure is considered and the theoretical foundations of the more important observed processes are presented. The materials main characteristics and parameters are being investigated. Possible fields of application in electrical and electronics engineering are briefly discussed. Some issues on the reliability of materials are analyzed. During the exercises, some of the most important processes, phenomena and properties discussed in the lectures are experimentally investigated using modern measuring equipment and computer technologies. The course is based on the subjects Higher Mathematics, Physics and others and realizes input connections with the subjects Electrical Measurements, Theoretical Electrical Engineering, Fundamentals of Automation and more.
Course content:
Dielectrics and dielectric materials. Physicochemical properties of materials. Semiconductor Materials. Conductive materials. Ferromagnetic materials. Nuclear power engineering materials.
Teaching and assessment:
The students' training is based on classical didactical approaches. Interactive whiteboards, specialized software and videos are used during the lecture presentations. Student self-study time is provided under the supervision of the teacher. The usage of appropriate Internet resources for further training is recommended. Students prepare themselves for the exercises in advance. In the beginning of each exercise, students undergo compulsory examinations for their knowledge. The attestation of the discipline is obtained when all exercises are completed. The assessment is written. The final grade is formed on the basis of the results from the subject tests, the examinations in the beginning of the exercises and on the course assignment.

Foreign Language II
S00761 English, S00763 German, S00764 French, S00842 Russian

ECTS credits: 5 **Weekly classes:** 0lec + 0sem + 0labs+ 6pr+0ca
Assessment: Colloquium **Type of exam:** written
Departments involved:
Department of Foreign Languages,
Faculty of Mechanical & Manufacturing Engineering
Lecturers:
Snr Lecturer Diana Stefanova, PhD, Dep. of Foreign Languages, tel.: +35982888532; dstefanova@uni-ruse.bg
Sr Lecturer Sergey Bartenev, Department of Foreign Languages; tel: 082 888 824, 230; sbartenev@uni-ruse.bg
Sr Lecturer Iliyana Benina, PhD, Department of Foreign Languages; tel: 082 888 815; ibenina@uni-ruse.bg
Abstract:
The foreign language module 2 is aimed at achieving communicative competence in the area of the subject specialism and the future job. The teaching objectives comprise the development of reading comprehension skills to handle specialist texts and the acquisition of communication skills to interact successfully in professional settings and everyday situations
Course content:
Getting to know each other. Personal characteristics. Mass media. Landscapes. Preparing a presentation. Entertainment. Working the night shift. Global warming.
Teaching and assessment:
The main form of teaching is practical exercises. It aims at developing the language skills of reading, writing, listening and speaking. A large variety of authentic and specially chosen texts (articles, charts, tables, brochures, catalogs, etc.), as well as audio and video materials, pair-work, group-work and discussions are used with the objective to develop skills for communicating in real situations. Different strategies for learning a foreign language are discussed and work both with traditional and electronic devices is recommended. The students are acquainted with the separate elements of the foreign language for academic purposes. The semester finishes with verification for regular attendance and a final written examination.

S03035 Mathematics 3

ECTS credits: 4
Weekly classes: 2lec + 0sem + 0labs+ 1pr+0ca
Assessment: Exam
Type of exam: written
Departments involved:
Department of Applied Mathematics and Statistics
Faculty of Natural Sciences and Education
Lecturers:
Assoc. Prof. Ilyana Raeva, PhD, Dept. of AES, tel. +35982888606; e-mail: iraeva@uni-ruse.bg
Assist. Prof. Stefka Karakoleva, PhD, Dept. of AES, tel. +35982888606, e-mail: skarakoleva@uni-ruse.bg
Abstract:
The objective of the course on Mathematics 3 is to give students knowledge and skills to solve engineering problems requiring: Fourier series; most common numerical methods of linear algebra and mathematical analysis; Mathematical apparatus of probability theory, the methods of mathematical statistics for processing experimental data.
Course content:
Fourier series, Numerical Methods for solving systems of linear equations, systems of nonlinear equations, least squares method for approximation of tabulated data. Elements of theory of probability, elements of statistics and data analysis.
Teaching and assessment:
The lecturers present the material theoretically and illustrate it with appropriate examples. The practical classes take place in computer labs. They are led by the teacher as an organized problem solving on a material from the lecture topics. The practical classes include also gaining experience with the software products MATLAB and SPSS. Two exams are taken during the semester – they offer the student the opportunity to get their final mark on the course without going on an exam – with minimum marks “Good (4)” on each of the control works. The course ends up with a written exam.

SB17665 Theoretic Electrical Engineering 2

ECTS credits: 5
Weekly classes: 2l + 0s + 1lab + 0pr + 1ca
Assessment: exam
Type of exam: written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE; tel.+35982888668, e-mail: daskalov@uni-ruse.bg
Assoc. Prof. Dr. Boris Ivanov Evstatiev, DcS, Dept. of AE; tel.: 082 888 371; bevstatiev@uni-ruse.bg
Abstract:
The course Theoretic Electrical Engineering 2 familiarizes the students with the main methods for analysis of transient modes in linear electric chains and with the main methods for analysis of settled and transient processes in a chain with distributed parameters and in non-linear electric chains.
Course content:
Transient processes in linear electric chains - introduction; classical method; operator method; frequency method; transient quantities, Duamelle integral; method with state variables. Chains with distributed parameters - main concepts; differential equations of a homogeneous line; settled sine process in a homogeneous line, input impedance; line with no losses, standing waves. Non-linear electric chains - constant modes, main laws and methods for analysis; periodic modes, electric chains inertia and non-inertia non-linear elements, analysis methods; resonance phenomena; transient processes, methods.
Teaching and assessment:
At the beginning of the semester each student is given an individual problem as a course work. It should be presented at the end of semester in a written form and is defended orally.
The final assessment is done at the examination (written and oral), which consists of solving problems and answering questions.

SB17666 Electrical Measurements

ECTS credits: 5 **Weekly classes:** 2l + 0s + 2lab + 0pr + 0ca
Assessment: Continuous assessment **Type of exam:** written
Departments involved:
Dept. of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.: +359 82 888 741,
E-mail: skadirova@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
"Electrical Measurements" course has the aim to make the students familiar with the basic methods and devices for electrical and non-electrical quantities evaluating as well as the metrical appraisals and results calculating. Another aim is students to acquire skills and habits which might be needed in measurement schemes and to solve particular problems as well as in students' activities as forthcoming experts – electrical engineers. The knowledge and skills acquired on this module are needed for the students to perceive the particular modules during the tutorials for metrical design ensuring of the technologic and production processes.
Course content:
Quantitative analysis and quantitative methods; Identification of a measuring method; Identification of a calculating method; A quality of the quantitative appraisals; Electrical and magnetic quantities; Assigning values to the electrical and magnetic quantities; Electrical quantities measuring by immediate comparison; Electrical quantities by mediate comparison; Digital electro-measuring appliances; Appliances for registration and observation; Electrical quantities calculating; Quantitative analysis of non-electrical quantities by electrical methods and devices; System for ensuring the unity of the measurements.
Teaching and assessment:
The process of the education on the "Electrical Measurements" module consists of lectures and tutorials. Lantern-slides and experimental models might be used as guides. Normally the tutorials are carried out into cycles. There are four places of work at the hall where on the average three students work together on each of it. The duration of each tutorial is three hours and at the end the students have to prepare a report. During the all-semester long marking is realized by testing at the time when the tutors are in progress and by periodical test control. The education is completed with an exam at the end of the third semester. Individual tutorials are carried out regularly at previously announced time for this purpose.

S03147 Engineering Mechanics

ECTS credits: 5 **Weekly classes:** 2l + 2s + 0lab+ 0pr+0ca
Assessment: continuous assessment **Type of exam:** written test
Departments involved:
Department of Engineering Mechanics,
Faculty of Mech. and Manufacturing Engineering
Lecturers:
Assoc. Prof. Velina Bozduganova, PhD, Dept. of EM, tel.: +359 82 888 224, e-mail velina@uni-ruse.bg
Principal Assistant Veselin Petrov, PhD, Dept. of EM, tel.:+359 82 888 572, e-mail: vepetrov@uni-ruse.bg
Abstract:
The course has four parts: Static, Strength of Materials, Kinematics, Dynamics. The aim of the course is for the students to get acquainted with the basic laws and methods of Engineering Mechanics in order to apply them when they solve mechanical problems. Preliminary knowledge in Mathematics and Physics are necessary for this course. The subject is a fundamental for the engineering courses Control Theory, Electromechanical Devices, Control of Electromechanical Systems, Dynamics of Mechanical systems, Machine Elements and Mechanisms, Hydraulic Machines and Pneumatics, Mechatronic Elements and Mechanisms, Robotics.
Course content:
Equilibrium of a rigid body. Equilibrium in presence of friction. Basic definitions and principles in Strength of Materials. Tension and compression. Particle kinematics. Translational, rotational and plane rigid body motion. Particle dynamics. Dynamics of mechanical systems. Lagrange's equations.
Teaching and assessment:
The lectures elucidate the theoretical basis of studied topics, while their application is illustrated by examples. Numerical examples are solved in seminar exercises. The final grade of student's knowledge is obtained by a Test System, which contains two tests and takes into account the activity of the students in the seminar exercises.

SB17672 Semiconductor Devices

ECTS credits: 5 **Weekly classes:** 2l + 0s + 2lab+ 0pr+0ca
Assessment: exam **Type of exam:** written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Krasimira Stefanova Shtereva, PhD, Dept. of AE, tel. 082888366, e-mail: kshtereva@ecs.uni-ruse.bg
Principal Assist. Yavor Branimirov Neikov, PhD, Department of AE, tel.: 082888772, E-mail: yneikov@uni-ruse.bg
Abstract:
The aim of the Semiconductor Devices course is to provide the students with the necessary knowledge of the structure, principle of operation, characteristics and the application areas of the most popular semiconductor devices (diodes, bipolar and field-effect transistors, optical device), as well as with skills for their practical use for the development of electronics products. A prerequisite is Physics.
Course content:
Fundamentals of the Physics of Semiconductors. p-n Junction and Metal – Semiconductor Contact. Semiconductor Diodes. The Bipolar Transistors. The Thyristors. The Junction Field-Effect Transistor (JFET). Metal-Oxide-Semiconductor Field-Effect Transistor (MOS FET). Optical Devices. Photovoltaic Devices. Active Matrix Flat-Panel Display (AMLCD).
Teaching and assessment:
The lectures are 2 hours each week. They are interactive with the use of multimedia. The laboratory exercises are 4 hours every second week and the whole group works on the same topic. A test is carried out at the beginning of each laboratory exercise. The test is graded on a scale from 0÷5 points. The students submit a report for each laboratory exercise to the course instructor. The additional requirements are according to the Internal Academic Regulations. Finishing course procedure is a written exam in the form of a test with a duration of 120 minutes. The test is graded on a scale from 0÷100 points. Final assessment is based: 20% on laboratory assignments and 80% on the final test.

SB17700 Data and signal processing

ECTS credits: 6 **Weekly classes:** 2l + 0s + 0lab+ 2pr+0ca
Assessment: exam **Type of exam:** written
Departments involved:
Department of: Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Donka Ilieva Ivanova, PhD, Dept. of AE, tel.+35982 888 266, e-mail: divanova@uni-ruse.bg
Principal Assist. Martin Plamenov Deyanov,PhD, Dept. of AE, tel.+35982888678, e-mail: mdejanov@uni-ruse.bg
Abstract:
The course aim is to introduce to the students methods for processing of continuous and discrete signals. The devices that realize analogue and digital signal processing are regarded. The course provides basic information from the theory of similarity, modeling, processing and generalizing of experimental data. Advanced knowledge of mathematics is required. The course gives knowledge and skills that are used in control systems.
Course content:
Information and signals. Fourier representation of periodic signals. Spectral analysis of non-periodic signals – right and inverse Fourier transformation. Discretization of continuous signals. Kotelnikov – Shenon's theorem. Z – transformation. Analogue and digital filters. Modulation. Methods of modeling. Data processing.
Teaching and assessment:
The topics of the lectures acquaint students with the methods of signal and data processing before the practical exercises. The latter deepen their knowledge of the issues from the lecture material. The exercises are conducted face to face. Students must be well prepared for the practical exercises and must prepare a report for each of them. Students are evaluated by the results of a written exam in which they solve problems and answer theoretical questions.

S03150 Pulse and Digital Devices

ECTS credits: 5 **Weekly classes:** 2l+0s+0lab+2pr
Assessment: Exam **Type of exam**: written test
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, PhD, Dept. of T, tel. 082888 823, e-mail: nina@uni-ruse.bg
Principal Assist. Ivanka Dimitrova Tsvetkova, PhD; Dept. of T, tel. 082 888836; e-mail: itsvetkova@uni-ruse.bg
Assoc. Prof. Adriana Naydenova Borodzhieva, PhD, Dept. of T, tel. 082888734,
e-mail: aborodzhieva@uni-ruse.bg
Abstract:
The subject has the objective to familiarize students with the main problems of digital electronics. It links the functions of the digital elements with their microelectronic basis on one hand, and on the other hand – with their application when building pulse and digital devices. Deep knowledge in electrical engineering and semiconductors is necessary. The subject helps to give knowledge in the field of hardware.
Course content:
Boolean algebra. Synthesis and analysis of combinational circuits. Digital circuits with memory. Forming circuits. TTL integrated circuits. CMOS logic integrated circuits. Triggers. Schmidt triggers. Multi-vibrators. Impulse circuits with operational amplifiers. Particularities of integrated circuits with middle scale of integration. Interface circuits.
Teaching and assessment:
The lectures give the students the opportunity to get acquainted theoretically with the main questions of digital electronics before the practical exercises. The students must be prepared for each exercise and at the end prepare a report for each of them. The exam is conducted in the form of a written test.

SB17701 Analog Devices

ECTS credits: 4 **Weekly classes:** 2l + 0s + 0lab + 1pr
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved:
Department of AE,
Faculty of Electrical Engineering, Electronics and Automation,
Lecturers:
Assoc. Prof. Anelia Vladimirova Manukova, DcS, Dept. of AE, tel. 082888773, e-mail: amanukova@uni-ruse.bg
Principal Assistant Snezhinka Zaharieva, PhD, Dept. of AE, tel. 082888382, e-mail: szaharieva@uni-ruse.bg
Abstract:
The compulsory subject gives the students the necessary minimum of knowledge in analog devices. It discusses the factors and methods for the realization of the most often used low-level and power amplifiers and generator stages in a discrete and integral input, methods for dc and ac analysis of the discussed circuits, as well as instructions for their design are used.
Course content:
General information about the amplifying engineering; main characteristics and operation modes. Back-coupling in the amplifiers; influence of the negative back-coupling on the main values of the amplifiers. Resistance of the amplifiers. Aperiodic amplifiers of small signals with a common emitter, common base and common collector by middle, low and high frequencies. Cascade circuits. Aperiodic amplifiers of power. Main elements from the analog devices of the analog integrated circuits. Differential amplifiers. Direct current amplifiers. Operational amplifiers - general characteristics and main circuits. The subject contains a course assignment.
Teaching and assessment:
Exercises carried out in two stages: analysis, design and measurement of the discussed device and/or computer analysis. Course assignment is involved. The continuous assessment during the exercises is done by oral discussions, checking of the homeworks. Method of continuous assessment – written and oral test.

SB17702 Control Theory 1

ECTS credits: 8 **Weekly classes:** 3lec + 0s + 0lab+ 2pr + 1cw
Assessment: Exam **Type of exam:** written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturer:
Assoc. Prof. Donka Ilieva Ivanova, PhD, Dept. of AE, tel.: +35982888266, e-mail: divanova@uni-ruse.bg
Principal Assist. Martin Plamenov Deyanov, PhD, Dept. of AE, tel.082888678, e-mail: mdejanov@uni-ruse.bg
Abstract:
The course aims to give knowledge and practical skills for modelling, analysis and synthesis of linear continuous-time control systems. Prerequisites to this course are the Mathematics and Signal Processing courses. The acquired knowledge has application in various fields of engineering. It is a basis for a number of courses in the specialty.
Course content:
Control systems: basic concept and definitions, classifications. Control systems design process. Mathematical models of linear continuous-time control systems: differential equations, transfer functions, block diagrams. Time-domain and frequency-domain characteristics. Stability analysis. Steady-state errors. Dynamic performance analysis. P, PI, PD and PID controllers. Digital controllers. Control systems design methods.
Teaching and assessment:
The lectures present the theoretic aspects of the addressed problems and illustrate them with appropriate examples. The aim of the practical exercises and the course work is to teach the students to apply the acquired knowledge creatively. They are conducted with the aid of the MATLAB software system. The students' progress is checked in each exercise throughout the semester. A different topic for the course work is assigned to each student. The course ends with a written exam which consists of problem solving and question answering. In order to be allowed to take the exam the students have to attend all the exercises as well as to write a course work. The practical work mark and the course work mark are both taken into consideration when forming the final course mark.

SB16086 Economics

ECTS credits: 3 Weekly classes: 2l+1s+0lab+0pr
Assessment: Continuous assessment Type of exam: written
Department involved:
Department of Economics
Faculty of Business and Management
Lecturers:
Assoc. prof. Dafina Doneva, PhD, Dept. of Economics, dgdoneva@uni-ruse.bg, tel. 082 888703
Assist. prof. Elizar Stanev, PhD, Dept. of Economics, eastanev@uni-ruse.bg, tel. 082 888703
Assist. prof. Peter Penchev, PhD, Dept. of Economics, ppenchev@uni-ruse.bg, tel. 082 888557
Abstract:
The subject is concerned with the general problems, laws and categories of the contemporary market economy. Thus, it creates a certain basis for the remaining economic objects. It also provides general knowledge, which is expressed in alternative ways of economic thought and creates abilities for independent and expert choice in economic surroundings. Course prerequisite is knowledge of mathematics and it is related to concrete branches and functional economic subjects.
Course content:
Introduction – the economic system and the fundamentals of economic theory. Market mechanism. Manufacture, company assets and expenses. Imperfect competition and supplying. Price formation and income depending on production factors: Gross domestic product and economic growth. Economic cycles, unemployment and inflation. Taxation, budget and monetary policy.
Teaching and assessment:
Material is taught in two ways – lectures and seminars, which elucidate and develop further some of the issues discussed at lectures. Continuous assessment is carried out. It includes two test assignments and the final grade is constituted by the average of the two.

SB17703 Electromechanical units

ECTS credits: 6 **Weekly classes:** 2l+ 0s+ 2lab+ 0pr + 1ca
Assessment: exam **Type of exam:** written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel.: +359 82 888 668; e-mail: daskalov@uni-ruse.bg
Principal Assist. Nikolay Petkov Valov, PhD, Dept. of AE, tel.:+359 82 888 253; e-mail: npvalov@uni-ruse.bg
Abstract:
In the "Electromechanical devices", students study basics of low voltage apparatus, contactors, motor protection, motors, electrical drives (DC and AC), as well as the means and methods of automation. It is a note of power engineering in electrical drive, as well as selection of electric motors. Basic reference: "Electrical engineering-1&2", "Electrical measurements", “Semiconductors”. Initial reference: “Control of electromechanical systems”, “Control of electrical drive systems” “Graduation thesis.
Course content:
Basic of electric engineering. Low voltage apparatus. Transformers. DC electric machines, AC electric machines. Single and special machines.
Teaching and assessment:
The basic forms of training are the auditory and the independent students’ work. Auditory work includes lectures and laboratory practice. It is used in industrial models, electrical drives, and particularly developed trial-pieces in the laboratory practice. Classes are visualized with prospectus and company literature. Laboratory practice is conducted in cycles. Attestation is given when all the lessons are being attended to. Final mark forms from the written exam’s result and the laboratory participation. There is an oral test if needed.

S03155 Foreign Language for Special Purposes

ECTS credits: 4 **Weekly classes:** 0l+3s+0lab+0pr
Assessment: Continuous assessment **Type of exam:** written
Department involved:
Department of Foreign Languages,
Faculty of Mechanical & Manufacturing Engineering
Lecturers:
Snr Lecturer Diana Stefanova, PhD, Dept. of Foreign Languages, tel.: 082 888 532; dstefanova@uni-ruse.bg
Abstract:
This module aims at achieving communicative competence in the area of the subject specialism and the future job. The teaching objectives comprise the development of reading comprehension skills to handle specialist texts and the acquisition of communication skills to interact successfully in professional settings and everyday situations.
Course content:
Electronics in the home. Alarm systems. Remote control. Recording systems. Graphs. Test and repair instruments. Computers. Telecommunications. Celltels. Data transmission.
Teaching and assessment:
To acquire the necessary language knowledge and to develop skills in using the language as a means of communication a wide range of authentic and specially constructed texts (i.e. articles, diagrams and tables, brochures, catalogs, manuals etc.) as well as audio, video, and multimedia materials are used. Students are offered lessons in computer laboratories, in which multimedia learning packages and on-line materials on the Internet are used according to the modern trends in foreign language teaching. In class students participate in role-plays, pair and group activities. In addition, students are given a translation assignment. Continuous assessment involves at least two written tests and oral testing as well.

SB16337 Marketing

ECTS credits: 4 **Weekly classes:** 2l + 1s + 0lab + 0pr
Test form: Continuous assessment **Form of examination:** written test
Methodical management:
Department of Management and Business Development,
Faculty of Business and Management
Lecturer:
Prof. Diana Antonova, PhD, Dept. MBD, tel. 082888219, e-mail: dantonova@uni-ruse.bg;
Principal Assist. M. Todorova, PhD, Dept. of MBD, tel. 082 888615, e-mail: mtodorova@uni-ruse.bg;
Abstract:
The course aims to acquaint students with basic theoretical questions and to develop practical skills for working on the leading directions of the marketing concept for business organization and management in the context of digitization of the market economy. This is accomplished through the approaches, stages and problems of the practical development of integrated marketing programs to connect with users and companies and to stimulate demand and sales through the use of electronic communications and marketing methods.
Course content:
Developing the marketing approach. Marketing Features. Marketing system. Market Development. Marketing research. Marketing Planning. Marketing Product Solutions. Distribution solutions. Pricing solutions. Marketing communication solutions.
Teaching and assessment:
The lectures bring the students into the themes - they explain the main issues and the specific features of marketing and its application in the business. When developing the course assignment, each student must show that he / she can analyze and present information in the field of marketing programs. A test is planned - twice a semester and includes theoretical questions from the lecture material. The final grade is formed as an arithmetic mean of the displayed knowledge of the tests, the exercises performed and the practical tasks fulfilled.

SB16182 World Economics

ECTS credits: 4 **Weekly classes:** 2l+1s+0lab+0pr
Assessment: Continuous assessment **Type of exam**: written
Department involved:
Department of Economics
Faculty of Business and Management
Lecturers:
Assoc. Prof. Aleksandar Angelov Kosuliev, PhD, Dept. of Economics, tel. 082 888 557, akosuliev@uni-ruse.bg
Abstract:
The subject World Economics is an integral part of Economics - mega-economy or international economy. It is concerned with the most general notions, categories and interconnections in world economic relations. Topics and themes like the following ones come within the perimeter of World Economics: international trade theories, duty taxes, non-tariff restrictions, international currency and credit market, a balance of payment, international corporations, world integrations and formations, global economic processes. Macroeconomics is a prerequisite for the course and it in turn is a prerequisite for all specific
Economic disciplines related to international economic relations.
Course content:
International trade and foreign trade restrictions. Currency market and currency policy. International flow of capital. Regional economic integration. Economic problems of developing countries.
Teaching and assessment:
The lectures provide most of the knowledge. The seminars have two aims: clarifying the more difficult items from the lectures and adding more information where necessary. Students' self-study is focused on the information from the lectures and related literature - individual tasks are assigned to find particular information for the seminars.
The final type of control is continuous assessment. It is in the form of two term tests (TT1 and TT2). At the end of the semester a continuous assessment mark is formed as the average of the TT1, TT2.

SB16338 Firm Management

ECTS credits: 4 **Weekly classes:** 2l+1s + 0lab+0pr
Assessment: test **Type of exam**: written
Departments involved:
Department of Management and Business Development,
Faculty of Business and Management
Lecturers:
Prof. Krasimir Enimanev, PhD, Dept. of Economics, tel. 082 888 704, e-mail: kenimanev@uni-ruse.bg
Assoc. Prof. Svilen Kunev, PhD, Dept. of MBD, tel. 082 888 617, e-mail: snkunev@uni-ruse.bg
Abstract:
The course “COMPANY MANAGEMENT” aims to provide students with knowledge about the basic issues, methods and approaches for effective organization and process management in existing business organizations, as well as the ability to schematically build a business model to start micro and small business units. Students are introduced to the essence of management as a science, concepts and theories, basic functions and achievements in the field of modern management.
The lecture's content has been systematized in accordance with modern perceptions in the theory of management, and the functional principle has been adopted. On this basis, five major sections of the discipline have been developed: planning, organizing, staffing, leadership and controlling.
The input-output links of the current discipline will vary depending on the specific specialty of the students, but they will primarily relate to practically oriented engineering disciplines, the development of some course projects and the diploma design.
Course content:
Management - theory and practice. Planning. Organizing. Staffing. Directing. Controlling.
Teaching and assessment:
The course material is fully presented during the lectures. Practical exercises are conducted on the main topics in order to deepen knowledge and facilitate the study of the discipline, as well as to acquire certain practical skills to achieve optimal management decisions. During the lectures and practical exercises, visual materials are used - boards, web-based materials, multimedia presentations. Students' knowledge is controlled through practical exercises based on the successful completion of assignments, real business case studies, tests and up to two supervisory works during the semester. The course ends with an ongoing assessment, which is formed by the following components: current control over the lecture material - 50%, weekly assignments of exercises - 40%, maximum attendance and active participation in the classes - 10%.

S03156 Dynamics of Mechanical Systems

ECTS credits: 4 **Weekly classes:** 2l + 1s + 0lab+ 0pr+0ca
Assessment: Continuous assessment **Type of exam:** tests
Departments involved:
Department of Engineering Mechanics (EM), Faculty of Mechanical and Manufacturing Engineering
Lecturers:
Assoc. Prof. Velina Bozduganova, PhD, Dept. of EM, tel.: +359 82 888 572, E-mail: velina@uni-ruse.bg
Principal Assistant Svetlin Stoyanov, PhD, Dept. of EM, tel. 082 888 622, e-mail: sstoyanov@uni-ruse.bg
Abstract:
The course has three parts: investigation of the motion of mechanical and electromechanical systems; linear and nonlinear vibrations of discrete and continuous systems; discretization of continuous systems. The aim of the course is the students to get the ability to compose models of mechanical and electromechanical systems, to investigate the motion of such systems, to discretize continuous mechanical systems. Preliminary knowledge in Mathematics, Physics, Programming and Computer Applications, Theory of Electrical Engineering, Technical Mechanics are necessary for this course. The subject is a fundamental for the engineering courses Control Theory, Control of Electromechanical Systems, Electromechanical Devices, System Identification, Elements and Mechanisms of Mechatronic Systems.
Course content:
Classification of mechanical systems. Lagrange’s equations for mechanical and electromechanical systems. Characteristics of elastic and dissipative elements. Determination of reaction forces of constrained systems. Vibrations of one DOF and finite DOF mechanical system. Vibration isolation. Vibrations of continuous mechanical systems. Continuous systems discretization methods. Nonlinear vibrations of mechanical systems.
Teaching and assessment:
The lectures elucidate the theoretical basis of studied topics, while their application is illustrated by examples. Numerical examples are solved in seminar exercises. The final grade of student’s knowledge is obtained by averaging the results of carried out tests.

SB17676 Practice 1

ECTS credits: 3 **Weekly classes:** 0l + 0s + 0lab + 60pr
Assessment: Colloquium **Type of exam:** oral

Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation

Lecturers:
Assoc. Prof. Tsvetelina Georgieva, PhD, Dept. of AE, tel. 082 888 668, e-mail: cgeorgieva@uni-ruse.bg
Principal Assistant Nikolay Petkov Valov, PhD, Dept. of AE, tel. 082 888 253, e-mail: npvalov@uni-ruse.bg

Abstract:
The main goals of this course are to improve the knowledge and skills of the students of the Department of Automatics and Electronics, which they got from the classes based in RU “Angel Kanchev” and to acquire and learn new, specific knowledge and skills in a real-life companies and organizations, involved in designing, development, production, operation and maintenance of automation systems, computer and office electronics and more.

Course content:
Production process of the factory or organization. Structure, tasks and organization of the work of different departments of the enterprise or organization. Structure, characteristics and parameters of the automation systems. Architecture, software programming, Input/output devices and abilities for expansion/updating and upgrading of computer systems.

Teaching and assessment:
Training placement for the students takes place in enterprises, companies, organizations with well-organized and modern industries or in companies and organizations which have signed a special contract with the department for practical training. The final grade is based on the review of the documentation gathered by the student during his work and training; discussions with the student and the head of the department in which the training was about the objectives achieved and acquired skills.

SB17704 Control Theory 2

ECTS credits: 7 **Weekly classes:** 2l + 0s+ 0lab+ 2pr + 1ca
Assessment: exam **Type of exam:** written

Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation

Lecturers:
Assoc. Prof. Donka Ilieva Ivanova, PhD, Dept. of AE, tel.: +35982888266, e-mail: divanova@uni-ruse.bg
Principal Assist. Martin Plamenov Deyanov ,PhD, Dept. of AE, tel. 082888678, e-mail: mdejanov@uni-ruse.bg

Abstract:
The aim of the course is to give knowledge and practical skills for modelling, analysis and synthesis of linear continuous control systems in state space, linear digital systems and nonlinear automatic control systems. Prerequisites to this course are the Control Theory - 1, Mathematics and Signal Processing courses. The acquired knowledge has application in various fields of engineering. It is also a basis for a number of courses in the specialty.

Course content:
State space description of linear continuous-time control systems. Analysis and design of control systems in state space. Mathematical models of digital control systems. Stability analysis, dynamic performance analysis and design of digital control systems. Nonlinear control systems.

Teaching and assessment:
The lectures present the theoretic aspects of the addressed problems and illustrate them with appropriate examples. The aim of the practical exercises and the course work is to teach the students to apply the acquired knowledge creatively. The students’ progress is checked in each exercise throughout the semester. A different topic for the course work is assigned to each student. The course ends with a written exam which consists of problem solving and question answering. In order to be allowed to take the exam the students have to attend all the exercises as well as to write a course work. The practical work mark and the course work mark are both taken into consideration when forming the final course mark.

SB17705 Microprocessors

ECTS credits: 4 **Weekly classes:** 1l + 0s + 2lab + 0p+ 1ca
Assessment: exam **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Daskalov, PhD, Dept. of AE, tel. 082 888 668, e-mail: daskalov@uni-ruse.bg
Principal Assistant Nikolay Valov, PhD, Dept. of AE, tel. 082 888 253, e-mail: npvalov@uni-ruse.bg
Abstract:
The course Microprocessors is a subject of the foundation of the specialty. Its aim is to introduce the students to the field of microprocessors. In the lectures are discussed topics on the architecture of microprocessors, memory, parallel and serial interfaces and timers. The interrupt system is learned and the assembly language.
Course content:
Computer bus organization. Main signals and logic structure of the processor. Programming model and interrupt system. Assembly language. Addresses and memory. Parallel and serial I/O. Introduce to microprocessors applications.
Teaching and assessment:
The lectures are two hours and are conducted every week. The lab exercises are three hours each and are made in a “frontal” manner. The course's final procedure is a written examination. The students create a program in assembly language. The student's knowledge is checked in this way.

SB17706 Elements of Automation Systems

ECTS credits: 7 **Weekly classes:** 3l + 0s + 2lab + 0pr
Assessment: exam **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Tzvetelina Georgieva, PhD, Dept. of AE, tel. 082 888 668, e-mail: cgeorgieva@uni-ruse.bg
Principal Assistant Nikolay Valov, PhD, Dept. of AE, tel.082 888 253, e-mail: npvalov@uni-ruse.bg
Abstract:
Through this discipline the students are introduced to the principles of design and formation of the control laws, some particular constructions of electronic, pneumatic and hydraulic regulators, executive mechanisms and regulating devices. The achieved knowledge will be the base of some disciplines, which will be studied later: "Special Controllers", “Automatic Control Systems Design”, Project “Automatic Control Systems Design“.
Course content:
Properties of the real regulators. Elements and assemblies of industrial electronic regulators. Industrial digital regulators. Operation of digital regulators in noisy environments. Pneumatic and hydraulic regulators. Executive mechanisms. Regulating devices. Transformers of the type of energy of signals.
Teaching and assessment:
The students are acquainted with the curriculum subjects by lectures. Practically the themes are carried out and developed through exercises and the course study. An individual report is prepared for each exercise, which is assessed by the lecturer after defense. The final mark for the semester is formed by an exam, as the marks from the exercises are taken into account.

SB17707 Control of Electromechanical Systems

ECTS credits: 6 **Weekly classes:** 2l + 0s + 2lab+ 0pr+1ca
Assessment: **Type of exam:** written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel.:+35982888668, E-mail: daskalov@uni-ruse.bg
Principal Assistant Nikolay Petkov Valov, PhD, Dept. of AE, tel.+35982888253; e-mail: npvalov@uni-ruse.bg
Abstract:
The aim of the course is to introduce the students from the department of A&M to the mechanics of electro-motion, the electromechanical properties of induction motors, the power engineering of electro-motion and the bases of dynamics of electro-motion. The discipline is based on the knowledge acquired during the following courses: “Theory of Electrical Engineering”, “Electromechanical Devices”, and is also connected to “Automated Electrical Drive Systems” or “Drive Systems in Mechatronics “.
Course content:
Basic equation of the electro-motion. Mechanical characteristics of the manufacturing mechanisms. Mechanical and electromechanical characteristics of the current electricity motors. Mechanical and electromechanical characteristics of the induction motors. Stopping the electric motors. Speed control of electro-motion. Transitional processes in electro-motion. Thermal processes in the electro-motion. Choice of power capacity of the electric motors.
Teaching and assessment:
The flowing assessment takes place both during lectures and practice classes and is combined with the results from the colloquium and 2 tests (one in the middle, and one in the end of the term). Point system for assessing students’ knowledge is also an option. If a student gets a poor mark on the first test, on the second test he should answer an additional question, based on the first-test material. If a student gets a poor mark on the second test, he should go in for a supplementary exam

SB17708 Sensor Technology

ECTS credits: 6 **Weekly classes:** 2l + 0s + 2lab + 0pr
Assessment: exam **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Tzvetelina Georgieva, PhD, Dept. of AE, tel. 082 888 668, e-mail: cgeorgieva@uni-ruse.bg
Abstract:
The topics of the course make students familiar with methods and technical devices for a transformation and control of basic technological values in the industry. The methods and measurement devices for transforming non-electrical values to electrical signals, from which are in dependence technologies, are analyzed and compared. The course foundation is the knowledge received in other courses: physics, electrical engineering, electronics, electrical measurements etc. and is in the connection with courses in student’s education.
Course content:
Measurements transducers. Structure of transformation. Static and dynamic characteristics. Measurement of mechanical values – electrical - resistance, induction, capacitance, force and weight sensors, pie-zoelectric and other transducers. Level measurement – capacitance, manometer and ultrasonic level transducers. Flow meters - electromagnetic, ultrasonic flow meters with variable - pressure drop meters. Active and passive temperature transducers and radiation thermometers. Humidity measurement – resistance, capacitance, absorption transducers and psychrometers. Pressure and vibration measurements.
Teaching and assessment:
The lectures’ themes are visualized with slides. There are in use firm’s production catalogs for measurement transducers and devices. In the lab computers are used for investigation of some measurement transducers. Written exam includes a number of problems with a different degree of difficulty.

SB10689 Elements and mechanisms of mechatronic systems

ECTS credits: 6 **Weekly classes:** 2lec + 0sem + 2labs+ 0ps
Assessment: exam **Type of exam:** written
Department involved:
Department of: Repair, Reliability, Machinery, Logistics and Chemical Technologies
Faculty: Agrarian and Industrial
Lecturers:
Assoc. Prof. Tanya Petkova Grozeva
Abstract:
The program is designed for students from Computer Control and Automation and gives basic knowledge in the field of precision engineering, optics, film / video / and audio and automation. The basic elements of mechanisms, devices and automatic equipment, and form skills for structural analysis, the right choice of great diversity elements to achieve the required accuracy and reliability and strength calculation when necessary.
Course content:
The course consists of lectures, laboratory exercises and essay.
Teaching and assessment:
The lectures cover the basic theoretical issues without detailed conclusions as theoretical formulations are illustrated with numerous examples. To visualize enjoy slides, kinematic models and models of modern mechanisms. Lectures can be presented with the help of computer. For further studying the lectures need independent use of that (and other) literature. In laboratory solve short and meaningful tasks of applied nature. The focus is on: 1) the modeling of material objects with basic models of mechanics; 2) assumptions, idealizations and justification of the choice of model, 3) the use of the basic laws and theorems of mechanics; 4) interpretation and understanding of the results.

SB17709 Computer Control Systems

ECST credits: 7 **Weekly classes:** 2l + 0s + 3lab + 0pr
Assessment: exam **Type of exam:** written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Tsvetelina Georgieva, PhD, Dept. of AE, tel. 082 888 668, e-mail: cgeorgieva@uni-ruse.bg
Abstract:
The course is a part of group subjects, which give knowledge in the field of microprocessors. She has foundation on previous training in subjects Analog and Digital electronics and Microprocessors. The organization, structure, functional algorithms and interaction between parts of the computer control systems are discussed.
Course content:
Organization of a computer control system. A/D and D/A converters. Structure of microprocessors and single-chip microcomputers. Memory organization: hierarchy, permanent and data memory, logic structure, address decoding etc. Input and output organization: software and hardware control of I/O, interrupt mechanism, special interface chips. Computer control systems design on the base of microprocessors and single - chip computers.
Teaching and assessment:
The lectures and the labs are once a week. The exam is written. The students write on two questions from the course syllabus and solve little tasks using assembly language for the single-chip microcomputer, which is used in the control system. The final mark is formed considering the results from the semester and examination.

SB17710 System Identification

ECTS credits: 6 **Weekly classes:** 2l + 0s + 0lab + 2pr + 1ca
Assessment: exam **Type of exam:** written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel. 082 888 668, e-mail: daskalov@uni-ruse.bg
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept. of AE, tel. 082 888 379, e-mail: msp@uni-ruse.bg
Abstract:
Knowledge in this area provides mathematical models of a dynamic system based on measured input-output data. It is based on knowledge in “Signals and data handling” and “Control theory”. The result of these studies contributes to the further development of one’s knowledge in the studies to come and the diploma project
Course content:
Derivative methods for identification – through time and frequency characteristics. Handling of characteristics. Statistical methods for identification – Viener – Hopf equation. Discrete linear models. Linear and non-linear approach to evaluating regression parametric models. Recurrent evaluation.
Teaching and assessment:
During the duration of the lectures are considered major questions concerning the curriculum. The exercises are held “directly”, as all the students are divided into sub-groups. Every exercise is held on a separate computer as the students are required to know the theory for the proper execution. At the end of the exercises, they are also required to present a thorough report. The course project is given to each student with an individual topic. The grade from the exercises and the course project plays a huge role in the final grade for the semester.

SB17711 Process Control

ECTS credits: 7 **Weekly classes:** 3l + 0s + 2lab + 0pr + 1ca
Assessment: exam **Type of exam:** written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Donka Ilieva Ivanova, PhD, Dept. of AE, tel.: +359 82 888 266, e-mail: divanova@uni-ruse.bg
Principal Assist. Martin Plamenov Deyanov, PhD, Dept. of AE, tel. 082 888 678, e-mail: mdejanov@uni-ruse.bg
Abstract:
The topics in the course introduce the basic ideas of process control to the students. In the course, the dynamic of some basic control strategies for automation systems are shown. The course includes training of systems for automatic control of basic process control parameters like - temperature, pressure, flow of fluids, level of liquid, bulk materials, pH and humidity. The course foundation is the knowledge received in other courses: Control Theory and Automation Systems Elements and serves the following courses: Process Control System Design and Industrial Control Systems.
Course content:
The basics of process control. Processes like objects for automation. Classification and main features of automation objects. Application of standard linear and nonlinear control laws in a single loop process control system. Application of cascade structures for processes control systems. Application of feedforward with feedback trim structures for process control systems. Application of multivariable control for processes control systems. Application of process control systems for dead time compensation. Temperature control systems. Pressure control systems. Level control systems. Bulk material ratio control systems. Fluids ratio control. PH control systems. Humidity control systems.
Teaching and assessment:
The lecture topics are illustrated with presentations. Exercises are conducted in cycles in a laboratory. The students prepare reports and defend them. The final grade in the course is based on the knowledge of the written exam.

SB17712 Computer Control Systems-Project

ECTS credits: 4 **Weekly classes:** 0l + 0s + 0lab + 2pr + 1cp
Assessment: continuous assessment **Type of exam:** defense of a project
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Tsvetelina Georgieva, PhD, Dept. of AE, tel.+35982888668, e-mail: cgeorgieva@uni-ruse.bg
Abstract:
The project aims to build up practical experience for the students for application of knowledge of computer science and programming. The project helps the students for development of skills for independently technical problems solving.
Course content:
The project topics concern measurement systems and control systems. The project tasks are closely connected with hardware development of single-chip processor systems. Some tasks about systems software are considered too.
Teaching and assessment:
The project is carried out in the following sequence: assigning of a project, literature studying, design of the electrical schemes and software, finalizing and defense of a report. The students carry out practical exercises one time per week at the lab and consultations are out of the auditorium about 3 hours per semester. The final project assessment is formed on the basis of the report quality.

SB17713 Control of electrical drive systems

ECTS credits: 6 **Weekly classes:** 2l + 0s + 2lab+ 0pr+ 0,5ca
Assessment: exam **Type of exam:** writing
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel. 082 888 668, e-mail: daskalov@uni-ruse.bg
Principal Assist. Nikolay Petkov Valov, PhD, Dep. of AE, tel. 082 888 253, e-mail: npvalov@uni-ruse.bg
Abstract:
The discipline “Control of electrical drive systems” is a continuation of the disciplines „Control of electromechanical systems” and “Electromechanical devices”. The aim of the course is to introduce the students from the department of A&M to the influence of different types of feed-back on the static and dynamic characteristics of closed electric drive systems. It reviews the combined work of electric motors, converters and the following particularities in the work of the electromechanical systems. There are certain incoming relations with another discipline “Computer Control of electrical drive systems” (a discipline from the MSC DEGREE COURSE).
Course content:
Basic knowledge for the electromechanical systems and the principles of building electrical drive systems. Electrical drive systems for current electricity. Electrical drive systems for alternating electricity. Frequency converters. Vector control of electrical drive systems for alternating electricity. Schemes. Drive system for step and brushless motors
Teaching and assessment:
The practice classes are carried every week in a cycle (3 lessons form a cycle). Flowing assessment takes place during the practice classes. A student must be present at all the practice classes and write a report for every one of them. The final exam is a written one, but also has a discussion part.

SB17714 System Drives in Mechatronics

ECTS credits: 6 **Weekly classes:** 2l + 0s + 2lab + 0pr + 1ac
Assessment: exam **Type of exam:** written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Krasimir Ivanov Tujarov, PhD, Dep. of HHEE, tel. 082888581, e-mail: tujarov@uni-ruse.bg
Principal Assist. Nikolay Petkov Valov, PhD, Dep. of AE, tel. 082 888 253, e-mail: npvalov@uni-ruse.bg
Abstract:
The discipline “Drive Systems in Mechatronics” is a continuation of the discipline „Control of Electromechanical Systems”. The aim of the course is to introduce the students from the department of A&M to the influence of different types of feed-back on the static and dynamic characteristics of closed electro-motion systems in mechatronics. It also reviews the hydraulic and pneumatic systems also used in mechatronics There are certain incoming relations with other disciplines “Computer Control of Electrical Drive Systems” (a discipline from the MSC DEGREE COURSE).
Course content:
Basic knowledge for the electromechanical systems and the principles of building electrical drive systems. Electrical drive systems for current electricity. Electrical drive systems for alternating electricity. Key elements of hydraulic and pneumatic actuators, and systems based on them are drives used in mechatronics.
Teaching and assessment:
The practice classes are carried every week in a cycle. Flowing assessment takes place during the practice classes. A student must be present at all the practice classes and write a report for every one of them. The final exam is a written one, but also has a discussion part.

SB17684 Practice 2

ECTS credits: 3 **Weekly classes:** 0l + 0s + 0lab + 90pr
Assessment: Colloquium **Type of exam:** oral
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Tsvetelina Georgieva, PhD, Dept. of AE, tel. 082888668, e-mail: cgeorgieva@uni-ruse.bg
Principal Assistant Nikolay Valov, PhD, Dept. of AE, tel. 082 888 253, e-mail: npvalov@uni-ruse.bg
Abstract:
The main goals of this course are to improve the knowledge and skills of the students of the Department of Automatics, Information and Control Engineering, which they got from the classes based in RU “Angel Kanchev” and to acquire and learn new, specific knowledge and skills in a real-life companies and organizations, involved in designing, development, production, operation and maintenance of automation systems, computer and office electronics and more.
Course content:
Production process of the factory or organization. Structure, tasks and organization of the work of different departments of the enterprise or organization. Structure, characteristics and parameters of the automation systems. Architecture, software programming, Input/output devices and abilities for expansion/updating and upgrading of computer systems.
Teaching and assessment:
Training placement for the students takes place in enterprises, companies, organizations with well-organized and modern industries or in companies and organizations which have signed a special contract with the department for practical training. The final grade is based on the review of the documentation gathered by the student during his work and training; discussions with the student and the head of the department in which the training was about the objectives achieved and acquired skills.

SB17715 Programmable logic controllers

ECTS credits: 7 **Weekly classes:** 2l + 0s + 3lab + 0pr+ 1ca
Assessment: exam **Type of exam:** written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturer:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel. 082 888 668, e-mail: daskalov@uni-ruse.bg
Assoc. Prof. Tsvetelina Georgieva, PhD, Dept. of AE, tel. 082888668, e-mail: cgeorgieva@uni-ruse.bg
Abstract:
Basic intelligence about the architecture, technical data and operation of the programmable logic controllers (PLC) are given in the course. The basic structure and the operation of the main input-output and communication PLC modules are considered in detail. Especially attention is devoted to PLC programming and use of advanced graphic programming languages and application of Eaton-Moeller EasyControl and XC100/200 PLC. Input links: "Microprocessor techniques" and "Computer Control Systems - Project"
Course content:
System architecture, functions and classification of PLC. Analog input/output modules. Digital input/output and communication PLC modules. PLC software structure. Textual and graphics PLC IEC 61131-3 programming languages. Grafcet diagrams and SFC graphic programming language. Structure and functions of Integrated Development Environment "*easySoft-CoDeSyS" and Closed-Loop Control Toolbox.*
Teaching and assessment:
The available technical teaching devices are used during the lectures. Laboratory exercises are cycles organized and carried out at the specialized laboratory of Moeller teaching Centre in the Department of Automatics and Electronics. Students are provided with user manuals for their teaching preparation. Before classes, the students' teaching backgrounds are examined. The results of experiments and software developments are entered in individual reports. The final student assessment is formed on the basis of a collection of the exercises assessment and written exam assessment.

SB17716 Industrial Communication Networks of Computer Control Systems

ECTS credits: 5 **Weekly classes:** 2l + 0s + 0lab + 2pr+ ca
Assessment: exam **Type of exam:** written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel. 082 888 668, e-mail: daskalov@uni-ruse.bg
Assoc. Prof. Tsvetelina Georgieva, PhD, Dept. of AE, tel. 082 888 668, e-mail: cgeorgieva@uni-ruse.bg
Abstract:
Basic intelligence about the architecture, communication standards and protocols of the industrial communication networks are given in the course. The network topologies, models and transmission methods are considered in details. Especially attention is devoted to field-level and information level industrial networks. Input links: "Computer Control Systems-2" and "Distributed Measurement Systems".
Course content:
Structure and architecture of computer control systems with industrial communication networks. Network models, standards and specifications. Open System Interconnect (OSI) network model. Network transmission methods. Media access methods - CSMA/CD, CSMS/CA, Token Passing, Demand Priority and CTDMA. Structure and basic characteristics of field-level industrial communication networks. Basic features of information level industrial networks. Network protocols ARP, TCP/IP and UDP. Basic OPC architectures and interfaces.
Teaching and assessment:
The available technical teaching devices are used during the lectures. Laboratory exercises are cycles organized and carried out at a teaching laboratory. Students are provided with user manuals for their teaching preparation. Before classes, the students' teaching backgrounds are examined. The results of experiments and software developments are entered in individual reports. The final student assessment is formed on the basis of a collection of the exercises assessment and written exam assessment.

SB17717 Process Control System Design

ECTS credits: 6 **Weekly classes:** 3l + 0s + 0lab + 2pr
Assessment: exam **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel. 082 888 668, e-mail: daskalov@uni-ruse.bg
Principal Assist. Martin Plamenov Deyanov, PhD, Dept. of AE, tel. 082 888 678, e-mail: mdejanov@uni-ruse.bg
Abstract:
The course objective is to give the students working knowledge in the main stages and activities of the design of process control systems. Different problems related with the choice of the system structure, the control algorithm and tuning of control systems are to be considered. The choice of components to implement the industrial systems. The students study the standards related to process control system design.
Course content:
Main stages in the design of process control systems. Choosing a system structure, control algorithm and tuning procedure. Methods to tune single loop, cascade, feed-forward with feedback trim and multi-connected control systems. Choosing hardware components for the industrial systems. Design and calculation of orifice devices in flowmeters, as well as valves and actuators in a control system. Basic standards, related to the design of process control systems. Basic requirements to design diagrams in control systems.
Teaching and assessment:
The course presents the main aspects related to the design of control systems. In the course students get an ability to solve problems related to the system design. The final mark is formed by the exam.

SB17718 CAD in electrical engineering

ECTS credits: 7 **Weekly classes:** 2l + 0s + 0lab + 2pr+1cp
Assessment: exam **Type of exam:** written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Tsvetelina Georgieva, PhD, Dept. of AE, tel. 082 888 668, e-mail: cgeorgieva@uni-ruse.bg
Abstract:
The course is optional for students in the field of Computer control and automation. The course objective is to teach students the principles of systems design in the field of electrical engineering, study technology for automated design of small buildings to large industrial projects and use computers and software in the design, planning and management of these projects.
Course contents:
Introduction in CAD systems. Structure, basic features and general functions of EPLAN Electric P8 software. Icons, Popup Menus, Dialogs and Toolboxes in EPLAN Electric P8 software. Schematic documents and macros. Graphical and External Reports. Management Tasks in EPLAN.
Teaching and assessment:
Training of students in this course is carried out by lectures, workshops and class work. Students acquire basic knowledge of creating and managing industrial projects. For illustration the course lecturers, appropriate materials presented through multimedia are used. The workshops are conducted in computer rooms equipped with a sufficient number of computers. The course project is given at the beginning of the semester.

SB10695 CAD in Mechatronics

ECTS credits: 7 **Weekly classes:** 2l+ 0s+0lab+2pr+cp
Assessment: exam **Type of exam:** written
Departments involved:
Department of Machine Tools & Manufacturing
Faculty of Mechanical & Manufacturing Engineering
Lecturers:
Assoc. Prof. Aleksandar Kirilov Ivanov, PhD, Dept. of MTM, tel. 082 888 714, E-mail: akivanov@uni-ruse.bg
Abstract:
The purpose of the course is to give students knowledge about the application of computers in the design process. Methods for geometrical modeling of parts or assemblies and general questions, connected to the creation of CAD systems, are considered. The course has input connections with the courses: Mathematics, Applied geometry and engineering graphics, Informatics, Machine details, Design methodology. The obtained knowledge is used in diploma projects.
Course content:
General information about the design of technical objects. Mathematical modeling in computer aided design. 2D-modelling. 3D-Solid modeling of parts and assemblies. Drawing Creation of parts and assemblies. Architecture and general principles of the CAD system creation.
Teaching and assessment:
Lectures give the main theoretical methods for geometrical modeling of parts or assemblies and possibilities for their realization. Students work, using computers and software, based on the methods given during lectures. Each student has to solve individual tasks. A web-based manual gives students the opportunity for self-training in a computer room with a free-access schedule. During the semester students develop and defend coursework. At the exam students answer two theoretical questions and solve one task, connected with the part modeling. A discussion with the student can be carried out for the formation of the final mark.

SB17719 Design of Process Control Systems - Project

ECTS credits: 4 **Weekly classes:** 0l + 0s + 0lab + 2pr +1cp
Assessment: Continuous assessment **Type of exam:** project defense
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel. 082 888 668, e-mail: daskalov@uni-ruse.bg
Principal Assist. Martin Plamenov Deyanov, PhD, Dept. of AE, tel. 082 888 678, e-mail: mdejanov@uni-ruse.bg
Abstract:
The course's objective is to strengthen and deepen theoretical and practical knowledge about a wide range of problems related to control systems design, like the choice of the system structure, the control algorithm, the tuning of control system, as well as the choice of the system components and graphical diagram development.
Course content:
Filtering and approximation of the experimental step response data taken from the object. Choosing a system structure. Choosing and tuning of the controller. Dynamic analysis and simulation of the control system. Choosing the control system components. Development of schematic diagrams for the system. System specification development.
Teaching and assessment:
Each student receives an individual assignment. At the time specified in the schedule, students submit a developed stage of the course project weekly. The next tasks of the project are discussed. At the end of the semester the students prepare a written report for the work done. The final mark is formed by the project defending 80% and 20% for the project development and exercise work.

SB10696 Design of Mechatronic Systems - Project

ECTS credits: 4 **Weekly classes:** 0l + 0s + 0lab + 2pr +1cp
Assessment: Continuous assessment **Type of exam:** project defense
Department involved:
Department of Machine Tools and Manufacturing
Faculty of Mechanical and Manufacturing Engineering
Lecturers:
Assoc. Prof. Dimityr Stefanov Dimitrov, PhD, Dept. MTM, tel.: 082 888 653; e-mail: ddimitrov@uni-ruse.bg
Abstract:
The course project is to develop a mechatronic device with given output conditions including: purpose and brief description of the device characteristics of the device and recommended element base. The project has connection with Electromechanical Devices, Control Theory - 1 and 2, the management of electromechanical systems, elements and mechanisms of Mechatronic Systems, Sensor Systems, C-I drives in mechatronics and programmable logic controllers.
Course content:
Analysis of the job. Requirements for designing devices. Known solutions for similar devices and their components. Advantages and disadvantages of the prior art.
Design of the device. Block diagram. Selecting / supplying mechanical assemblies. Kinematic scheme. Selection of mechanical and propulsion. Developing principled electronic control circuits. Selecting the element base. Calculation of the components.
Working with the device. Action, service, features into the service.
Teaching and assessment:
Students receive jobs describing the requirements for the design device stages of solving the problem, and a list of references. Within the prescribed workload they conduct practical exercises and attend the mandatory weekly consultations. The projects are submitted by the end of the semester. It encourages the use of computer programs for engineering graphics, computer simulation programs and software for word processing and presentation. obtaining Semester validation is done with a regular work assignment and according to the internal rules of the University. The assessment is formed by defense and impressions of the work during semester

SB17720 Digital Signal and Data Processing

ECTS credits: 5 **Weekly classes:** 3l + 0s + 0lab + 3pr
Assessment: exam **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Donka Ilieva Ivanova, PhD, Dept. of AE, tel.: +359 82 888 266, e-mail: divanova@uni-ruse.bg
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept. of AE, tel. 082 888 379, e-mail: msp@uni-ruse.bg
Abstract:
The subject's goal is to introduce the students to the current methods for one-dimensional digital signal processing. It introduced knowledge of the mathematical methods for digital signal processing, design of finite and infinite impulse response filters, spectral transference, decimation and interpolation of digital signals, performance and architecture of digital signal processors. The discipline forms knowledge and skills finding application in image identification, digital control systems etc.
Course content:
Introduction to digital signal processing. Digital representation of signals. Representation of discrete signals in the frequency domain. Definition of the Fourier transform of discrete signals. Fast Fourier transforms. Design of the finite and infinite impulse response filters. Spectral transference. Decimation and interpolation of digital signals. Digital signal processors. Application of digital signal processing.
Teaching and assessment:
The subjects of the lectures introduce the students to the methods of digital signal and data processing. The exercises follow the lectured material. The students are separated into subgroups. The students have to be ready for the exercise and they prepare a report on it. The rating of this subject is formed from the results of the written exam.

SB17721 Intelligent Systems and Sensors

ECTS credits: 5 **Weekly classes:** 3l + 0s + 3lab + 0pr
Assessment: Continuous assessment **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel. 082 888 668, e-mail: daskalov@uni-ruse.bg
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept. of AE, tel. 082 888 379, e-mail: msp@uni-ruse.bg
Abstract:
The course aims to give the students working knowledge in modern sensor techniques and their application in the artificial intelligence systems. Focused on the following sensor groups: tactile sensors, F/T sensors, location sensors and visual sensors. It treats the following topics: the structure, the technical characteristics, the basic principles and methods for processing sensor information and different aspects of sensor application, as well as modern principles and instruments for “sensor fusion”.
Course content:
Basic characteristics of the artificial intelligence systems. Tactile sensors, tactile matrices. Tactile information processing. F/T sensors – basic characteristics, analytical transformations, applications. Ultrasonic and optical sensors. Speech sensors and speech recognition. Computer vision systems. Visual sensors. Image processing. Multifunctional sensor systems. Application of the Kalman filter and Bayes networks for “multisensor fusion”.
Teaching and assessment:
The lectures present the main theory material by multimedia system and illustrate it with appropriate example problems. Lecture materials will be given out in advance to the students on CD. The workshops are held in a laboratory where the students use specialized equipment and software. They are provided with appropriate workshop materials. The final mark is formed on the basis of two written exams during the semester and on the basis of the results from workshops.

SB17723 Industrial Control Systems

ECTS credits: 3 **Weekly classes:** 2l + 0s + 2lab + 0pr
Assessment: exam **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept. of AE, tel. 082 888 379, e-mail: msp@uni-ruse.bg
Principal Assist. Martin Plamenov Deyanov, PhD, Dept. of AE, tel. 082 888 678, e-mail: mdejanov@uni-ruse.bg
Abstract:
The topics in the course introduce the main aspects of some widespread industrial control systems (ICS). Also considered are some software, hardware and communication tools used in industrial practice. The course deals with the control of industrial processes in the following areas: food, chemical and oil refining, as well as in the field of building management systems (BMS). The course is based on the knowledge obtained by the following courses: Process control, Computer Controlled Systems, Control Instrumentation and Design of process control systems.
Course content: Basic components and architectures for ICS systems. Basic control components in the ICS – SCADA. Basic control components in the ICS – DCS. Basic control components in the ICS – PLC. ICS systems in the food industry. ICS systems in the chemical industry. ICS systems in the oil refinery industry. ICS in the building management systems.
Teaching and assessment:
The lecture topics are illustrated with presentations. Laboratory classes are conducted in cycles. The students prepare reports and defend them. The final written exam mark is based on the knowledge of the written exam.

SB17725 Quality Control

ECTS credits: 3 **Weekly classes:** 2l + 0s + 2lab + 0pr
Assessment: continuous assessment **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept. of AE, tel. 082 888 379, e-mail: msp@uni-ruse.bg
Principal Assist. Martin Plamenov Deyanov, PhD, Dept. of AE, tel. 082 888 678, e-mail: mdejanov@uni-ruse.bg
Abstract:
The course is focused on the main problems, approaches, methods and tools for automated assessment of the quality of different industrial and food products. Basic criteria and indicators for quality control as well as traditional methods for their evaluation are discussed. Modern alternative methods and tools for express and automated quality assessment, based on the image processing, spectra analysis and hyperspectral imaging are presented, as well as other instrumental methods for analyses and assessment.
Course content:
Quality control as an object for automatization. Basic criteria and indicators for quality control, normative basis. Traditional methods for quality control. Modern alternative methods and tools for express and automated quality assessment, based on the image processing, spectra analysis, hyperspectral imaging and other instrumental methods. Methods and tools for investigated products categorization.
Teaching and assessment:
The lectures present the main theoretical aspects in the subject domain by multimedia system and illustrate it with appropriate examples. Lectures will be given to the students in advance. The practical exercises will be realized in a laboratory, where the students will use specialized equipment and software. They are provided with appropriate training aids. The final mark is formed on the basis of two written exams during the semester and of the results from practical exercises.

SB17724 Interfacing

ECTS credits: 3 **Weekly classes:** 2l + 0s + 2lab + 0pr
Assessment: exam **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof., Georgi Nikolov Krastev, Doctor of Science, Department of Computer systems and technologies,
tel.: 082 888 672, e-mail: georgi.krastev@abv.bg
Annotation:
The aim of the subject is to familiarize the students with the main aspects of man-machine systems. The subject is interdisciplinary and uses methods of engineering psychology, physiology, ergonomics, computer science, automatic control theory, anthropology and many others.
Syllabus contents:
Human as control system in control loop. Characteristics of man as a control system. Receiving, storing and transmitting information from a human being as a control system. Human - Machine Interfaces (HMI). Modifications of human - machine systems. Human Machine Interface with Leap Motion. Human Machine Interface with Myo Armband. 3D video technologies. Robots for telepresence. Human Machine Interface with Kinect. Brain-computer interface. Neurofeedback. Emotiv EEG.
Teaching and learning methods:
The subjects of the lectures introduce the students to the methods of interfacing. The exercises follow the lectured material. They work as students are separated into subgroups. The students have to be ready for the exercise and they prepare a report on it. The rating of this subject is formed from the results of the written exam.

SB17726 Robotics

ECTS credits: 3 **Weekly classes:** 2l + 0s + 2lab + 0pr
Assessment: Continuous assessment **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel. 082 888 668, e-mail: daskalov@uni-ruse.bg
Assoc. Prof. Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept. of AE, tel. 082 888 379,
e-mail: msp@uni-ruse.bg
Annotation: The course "Robotics" aims to give the students basic knowledge related to the basic systems of robots (manipulation, mobile, installation, servicing, etc.) as well as to the typical areas and specifics of their application. Major robot systems, such as manipulation systems, drive systems, control systems, and modern robot sensor systems are being explored. It is focused on robot applications in automated modules and lines in machine building, a variety of mobile robot applications, the use of intelligent robots to help people with disabilities, and others.
Syllabus contents: Introduction. Types of robots. Applications. Structure of robots. Main Components. Drives. Handling devices. Gripping devices. Terminals. Control devices. Sensitivity. Robot sensor and control devices. Sensors for the internal state of the robot. Sensors for assessment and interaction with the environment. Robot control devices. Typical robot applications in the industry. Industrial robots. Applications of manipulation robots in automated modules and lines in machine building. Robots for assembly automation, welding, coating and others. Specific applications of robots. Mobile robots for exploring dangerous environments. Intelligent robots to help people with disabilities. Robots for military purposes. Application of robots in medicine, agriculture and others.
Teaching and learning methods: The lecture material is provided to the students in electronic form at the beginning of the semester. In the lectures, the theoretical foundations of the topics studied are illustrated, illustrated by appropriate examples. Exercises are conducted demonstrational (sequentially). Students have instructions for conducting laboratory exercises, which are given in electronic and printed form. On the territory of the RU there is a sufficient available base for the exercises. Student readiness for practical work is assessed at the beginning of the exercises during the discussion of the purpose and the way the exercise is conducted.
The discipline ends with an on-going assessment. The final evaluation is based mainly on the results of the two assessments (70%), as well as the results of the current monitoring and protection of the protocols (30%).

SB17728 / SB17727 Bachelor Thesis / State exam

ECTS credits: 10 **Weekly classes**: 0l + 0s+ 0lab + 0pr
Assessment: official defense/exam **Type of exam**: oral/written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Consultants:
All lecturers from the Department of Automatics and Electronics
Abstract: The Bachelor thesis is a separate assignment, which is developed under the supervision of a scientific supervisor, and if necessary – and a scientific advisor. It is necessary that the students apply the knowledge and skills gained during the course, in order to achieve the aims and objectives of the bachelor thesis and to successfully defend their thesis in front of a board of examiners.
The exam is conducted in front of a state board of examiners, with a curriculum, which includes topics from all general subjects.
Course content: The Bachelor thesis consists of an explanatory note on calculations– it includes all the main literature data, ideas, existing solutions, analyses, calculations, explanations and conclusions; graphical part – it includes principle electrical circuits of knots, devices, block and structure circuits, graphical dependencies from experiment tests of developed control systems; a developed model of control system by the final year student, if this is part of the assignment. The model development is the final stage from the design work of the final year student.
Teaching and assessment: The Department of Automatics and Electronics provides: collecting, confirming and announcing theme suggestions for the Bachelor thesis; the distribution of the students per theme and research advisors for each of them; the diploma practice organization; the supervision, review and presentation of the Bachelor thesis.
Weekly tutorials with the research advisors are envisaged for the students. Then the process of the fulfillment of the given assignment is monitored. The bachelor defends his thesis in front of a state board of examiners.

UNDERGRADUATE STUDIES IN COMPUTER SYSTEMS AND TECHNOLOGIES

PROFESSIONAL STANDARDS OF A BACHELOR IN

COMPUTER SYSTEMS AND TECHNOLOGIES

Degree course: **Computer Systems and Technologies**
Degree awarded: **Bachelor of Engineering (BEng)**
Professional Qualification: **ComputerEngineer**
Duration: **4 years (8 terms)**

These standards define the requirements that the education of a Bachelor of Engineering in Computer Systems and Technologies should meet with respect to a successful career.

Bachelors should possess fundamental knowledge in a wide range of topics within the Computer Systems and Technologies area and be prepared for employment in any area where they are used.

In order to effectively render their role in the Information Society, bachelors of CST should possess the following key knowledge and skills:

1. Key theoretical knowledge:

A Bachelor of CST should:

- acquire core knowledge in mathematics, physics, electrical engineering, electronics and digital circuits;
- have in-depth knowledge of the hardware and architecture of computer systems;
- have in-depth knowledge of the system and application software of computer systems;
- have good command of the methods and tools for software development (procedural, object-oriented, declarative and other programming languages) under different operating systems, as well as for the Internet;
- be familiar with the theory of computer networks and communications;
- be familiar with the theory of databases and information systems;
- have specialist knowledge in computer systems and/or computer technologies.

2. Key practical skills:

A Bachelor of CST should:

- be able to self-dependently solve problems by creatively applying the acquired knowledge, by using advanced methods and tools and by applying complex technical and economic approach;
- be able to carry out research, development, manufacturing, maintenance and service activities, with respect to computer systems usage;
- be able to develop system and application software for universal and specialised computer systems;
- be able to take part in the design and administration of computer networks;
- be able to take part in the creation and support of databases and information systems;
- be able to adapt and deploy advanced computer technologies in various subject areas;
- be proficient in technical English.

3. Additional knowledge and skills:

A Bachelor of CST should:

- be aware of legal and ethical aspects of the CST area;
- have knowledge and skills for business communications and be able to carry out business negotiations and correspondence;
- be able to work in a team with representatives of the same and different professions;
- be able to seek, find and use information for solving problems in various areas;
- be able to prepare working and technical documentation, deliver presentations, present their views of specific technical problems and their solutions before various audiences, using modern technical and software tools;
- be able to self-dependently plan and accomplish the enhancement of their professional qualifications, as well as that of their colleagues, according to the life-long learning principle.

Bachelors of Engineering in Computer Systems and Technologies must have a clear understanding of their place and role within the Information Society and the responsibilities associated with that.

CURRICULUM

of the degree course in

COMPUTER SYSTEMS AND TECHNOLOGIES

First year

Code	First term	ECTS	Code	Second term	ECTS
S00413	Introduction to Communications and Computer Technologies	3	S02793	Higher Mathematics 2	5
S01604	Higher Mathematics 1	6	SB15451	Object Oriented Programming	6
SB15447	Programming	9	SB15452	Theory of Electrical Engineering	7
SB15449	Physics	5	SB15453	Electrical Measurements	4
SB15448	3D Technologies	5	SB15454	Semiconductors	6
SB15450	English Language 1	2	SB15455	English Language 2	2
	Total for the term:	**30**		***Total for the term:***	**30**
S00072	Sports	1	S00072	Sports	1

Second year

Code	Third term	ECTS	Code	Fourth term	ECTS
S03065	Higher Mathematics 3	5	S03067	Databases	6
S03062	Synthesis and Analysis of Algorithms	7	S03076	Design Technology	4
S03063	Analysis and Synthesis of Logical Diagrams	5	S03069	Digital Electronics	4
S03071	Computer Graphics	4	S03070	Computer Organization	6
S03079	Programming Languages	6	S03064	Web Design	5
SB15456	Technical English	3	S03072	Data Transmission and Computer Communications	5
	Total for the term:	**30**		***Total for the term:***	**30**
S00072	Sports	1	S00072	Sports	1
			S01841	Practical Training 1 (3 weeks)	3

Third year

Code	Fifth term	ECTS	Code	Sixth term	ECTS
S03073	Software Engineering	6	SB15458	Cryptography and Data Protection	6
S03074	System Programming	4	S03082	Computer Architectures	6
S03075	Microprocessors	7	SB15459	Computer Reliability and Security	6
SB15457	Discrete Structures and Modelling	5	S03105	Economics	4
S03077	Computer Peripherals	4	SB15460	Project	2
S03078	Integrated Development Environment	4		**Elective groups of courses** ***(students elect a group)*** **Group A**	
			SB15461	Computer Systems Design	6
				Total for the term for group A:	***30***
				Group B	
			SB15462	Artificial Intelligence	6
	Total for the term:	***30***		***Total for the term for group B:***	***30***
S00072	Sports	1	S00072	Sports	1
			S03086	Practical Training 2 (4 weeks)	4
	Optional courses			**Optional courses**	
SB11273	Company Culture and Business Ethics	3	SB15473	Ecology Management	3
SB11271	Business Communication and Public Relations	3			
SB11272	Business Negotiations and Correspondence	3			

Fourth year

Code	*Seventh term*	*ECTS*	*Code*	*Eighth term*	*ECTS*
S03087	Web Programming	5	SB11283	Local Area Networks	4
S03088	Operating Systems	6	S03096	Diploma Practice	4
SB11276	Computer Networks	5			
SB11277	Multimedia Systems and Technologies	4		***Elective courses (students elect one course)***	
			SB11284	Computer Telecommunication Systems	4
			SB11285	Computer Vision	4
	Elective groups of courses *(students elect a group)*			**Elective groups of courses *(students elect a group)***	
	Group A			**Group A**	
SB11278	Computer Control Systems	5	SB11286	Real Time Systems	4
SB15465	Single-chip Microcontrollers	5	SB11287	Parallel Computer Systems	4
	Group B			**Group B**	
SB15464	Information Systems	5	SB15466	Distributed Web Applications	4
S03094	Language Processors	5	SB11289	Computer Graphics Systems	4
	Optional courses			**Graduation**	
SB11280	Introduction to European Integration	3	S03103	Diploma work	10
SB15474	Institutions and Decision-Making in the EU	3			
SB15475	Intercultural Communication in the EU	3			
	Total for the term:	***30***		***Total for the term:***	***30***
S00072	Sports	1	S00021	Sports	1

Total for the degree course : 240 ECTS credits

S00413 Introduction to Communications and Computer Technologies

ECTS credits: 3
Weekly classes: 1lec+0sem+0labs+1ps
Assessment: continuous assessment
Type of exam: written and oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Svetlana Stefanova, MEng, PhD, Dept. of CST, tel: +359 82 888 356,
E-mail: SStefanova@ecs.uni-ruse.bg
Principal Assistant Lachezar Lazarov Yordanov, MEng, PhD, Dept. of CST, tel: +359 82 888 859,
E-mail: LIordanov@ecs.uni-ruse.bg
Abstract:
The course aims to introduce first year students to the current state and trends in the ICT fields, as well as to give basic knowledge and skills for using a PC, working with DOS and Windows applications, the Internet, etc. The students will need these basic skills in their further education.
Course content:
Structure of a personal computer, motherboard; functions and characteristics of the main modules, computer periphery; basic elements of computer and communications equipment, connections and markings; Microsoft Windows operating system; Microsoft Office (Word, Excel, Power Point); telecommunications equipment and technologies; Internet and Internet technologies; browsers.
Teaching and assessment:
Lectures are delivered 2 hours per week every week for the first eight weeks. The practical sessions are conducted in specialized labs at the departments of Computer Systems and Communication Technique and Technologies. The final mark is based on a mid-term test and a presentation on a specified topic. The test includes theoretical questions and practical tasks.

S01604 Higher Mathematics 1

ECTS credits: 6
Workload per week: 2l+2s+0lab+0p+r
Assessment: exam
Type of exam: written
Departments involved:
Department of Mathematics
Faculty of Natural Sciences and Education
Lecturers:
Assoc. Prof. Yuriy Dimitrov Kandilarov, PhD, Department of Mathematics, phone 888 634,
E-mail: ukandilarov@uni-ruse.bg
Assoc. Prof. Antoaneta Tileva Mihova, PhD, Department of Mathematics, phone 888 727,
E-mail: amihova@uni-ruse.bg
Summary:
Higher Mathematics 1 is fundamental to engineering education and builds on the studies of Mathematics from secondary education. It is imperative to the students' education in other mathematical subjects as well as in Physics, Mechanics, Electrical engineering and a number of general engineering subjects. The course includes topics from Linear algebra and analytical geometry, Differential and integral calculus of function of a variable.
Course syllabus:
Linear algebra – matrices, determinants, system of linear equations; Vector algebra – vector operations; Plane analytical geometry – line in plane; Differential calculus of function of a variable - derivative of function and applications; Integral calculus – basic integration techniques, integration of rational functions.
Teaching and assessment:
The students get acquainted via lectures with basic mathematical notions. By rule, the theorems do not include proofs but there are many examples and applications given. The seminars develop the students' technical ability for practical problem solving. Students are allowed to use formulas during classes, tests and exam. Students should prepare for the seminars by learning the course material and examples. The exam is considered passed only if the student has solved at least two problems. One of those problems should be chosen from the Linear algebra, Vector algebra and Analytical geometry sections. The other one should be chosen from the Differential and integral calculus of a function of a variable. The final mark is formed after a talk with the student.

SB15447 Programming

ECTS credits: 9
Weekly classes:3lec+0sem+0labs+3ws+cw
Assessment: exam
Type of exam: written
Responsible department:
Informatics and Information Technologies
Faculty of Natural Sciences and Education
Lecturers:
Prof. Tzvetomir Vassilev, MEng, PhD, Dept. of Informatics and Information Technologies, tel. 888 475,
Email: tvassilev@uni-ruse.bg
Summary:
The course is an introduction to programming and aims at acquiring skills to develop algorithms and computer programs with intermediate difficulty. Significant attention is paid to developing algorithms, as the skill to create algorithms is very important in order to develop effective programs. The C++ programming language is studied, which is widely spread and used in later courses.
Syllabus Contents:
Principle of program control, computer components, data representation. Developing programs. Algorithms. Boolean algebra. Introduction to C++ programming language. Operations, expression. Assignment statement. Data input and output. IF and switch statements. Repetition. Arrays, pointers. Functions. Strings. Structures. Files. Classes and objects.
Teaching and Learning Methods:
The lectures clarify the theoretic aspect of the topics and have a sufficient number of examples. This enables the students to prepare in advance for the workshops and to work independently during the classes.
The workshops are held in computer labs. The students do practical work developing, testing and debugging C programs.
The exam is written. It comprises problems that require developing a program and a commenting on existing programs. The problems have several items with an increasing level of difficulty.

SB15449 Physics

ECTS credits: 5
Weekly classes: 2lec + 0sem + 2labs+ 0ps
Assessment: exam
Type of exam: written, test
Departments involved:
Department of MMEEG and Physics
Faculty of Transport
Lecturers:
Assoc. Prof. Petko Hristov Mashkov, MEng, PhD, Dept. of MMEEG and Physics, tel: 082888583,
E-mail: pmashkov@uni-ruse.bg
Abstract:
The course aim is to introduce students to the physical character of processes and phenomena in nature and the methods of their investigation, with the most general properties of the matter and material objects. The laboratory exercises aim at creating skills for experimental investigation of physical phenomena.
Course content:
Measuring physical quantities. Mechanics of material point. Work and energy. Laws of conservation in mechanics. Oscillations & waves. Acoustics. Molecular physics and thermodynamics. Electric field and electric current. Magnetic field and magnetic forces. Electromagnetic field. Wave, geometric & quantum optics. Elements of Semiconductor physics and of Atomic & Nuclear physics.
Teaching and assessment:
Lectures give the main theoretical material, supported by some experimental and multimedia demonstrations of physical phenomena and processes. At the laboratory sessions the students work experimentally and investigate particular physical phenomena. Student knowledge of the theoretical material is tested regularly. The exam is in a form of test. The end mark depends on the results of the test and of the laboratory sessions.

SB15448 3D Technologies

ECTS credits: 5 **Weekly workload:** 2l+0s+0lab+2p
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Telecommunications, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Valentinov Hristov, MEng, PhD; Department of Telecommunications; tel.: (+359 82) 888 663; E-mail: ghristov@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, MEng, PhD; Department of Telecommunications; tel.: (+359 82) 888 353; E-mail: dkyuchukova@uni-ruse.bg
Abstract:
3D Technologies is to familiarize students with the modern methods for creating 3D models and their application in different areas. The 3D technologies are becoming widely spread in different areas – education, industry, entertainment, advertisement and others. This will give the students who pass the course and acquire the basic knowledge the ability to find professional realization in wider area.
Course content:
The expected results are for students to acquire the necessary knowledge and skills to work with modern technologies for 3D scanning, modelling, animation, 3D printing and building application with augmented and virtual reality. Students will acquire advanced and in-depth theoretical and practical knowledge for creation of three-dimensional computer models – photogrammetry, triangulation, 3D scanning. They will get acquainted with the various technologies for 3D printing and will have the necessary knowledge to create various applications, computer games and animations. After completing the course, students will be able to apply the basic techniques for reconstruction and creation of three-dimensional computer models. They will acquire skills for digitalization of objects through photogrammetry and 3D scanning. They will learn how to create augmented and virtual reality applications and will be able to create photorealistic scenes by properly rendering the objects in the scenes. In addition, they will be able to perform prepress and be able to create real copies of objects by using 3D printers.
Teaching and assessment:
The course includes 2 weekly hours of lectures and 2 hours of workshops. The workshops are held in a computer lab equipped with 3D scanners, 3D printers, cameras, workstations with software for 3D reconstruction, modelling and rendering.

SB15450 English Language 1

ECTS credits: 2 **Weekly workload**: 0L+0S+0Lab+2P
Assessment: continuous assessment **Type of exam**: written and oral
Department involved:
Department of Foreign Languages, Faculty of Mechanical Engineering
Lecturers:
Sr. Lecturer Mariela Risova, Dep. of Foreign Languages, tel: 082 888816; E-mail: mrisova@uni-ruse.bg
Abstract:
The subject English Part 1 for the degree courses *Computer Systems and Technologies*, *Internet and Mobile Communications and Information and Communication Technologies* comprises 30 hours of classroom work and provides basic skills for oral and written communication in the foreign language in view of the students' field of study. New vocabulary connected with the basic terminology of the specialized subjects is acquired. General topics related to the field of informatics and computer science are considered. Skills to elicit essential information from a text and write a summary are developed. Students are expected to prepare and give a short presentation on a chosen topic related to computing or IT. A prerequisite for 'English Part 1' is an English course taken in secondary school.
Course content:
Education, professions and professional realisation; Computer sciences. Inventions and discoveries; Living in a digital era. Computing and communication systems; Computer essentials. Inside a PC system. Smartphones, laptops, tablets. Steve Jobs presenting the I-Pad. Input devices. Interacting with your computer. Display screens and ergonomics. Magnetic storage. Specifics of technical English grammar and vocabulary.
Teaching and assessment:
The practical exercises include the following components: introducing new information; summary and revision; presenting and analysing individually accomplished tasks; knowledge reinforcement through diverse exercises - role-plays, work on authentic texts and in a computer room. Students are given two written tests during the semester.
The requirements for obtaining a semester validation signature are regular attendance, completing assigned tasks, giving a presentation and doing the tests. The final mark is based on continuous assessment.

S02793 Higher Mathematics 2

ECTS credits: 5
Weekly classes: 2lec+2sem+0labs+0ps
Assessment: exam
Type of exam: written and oral
Department involved:
Department of Mathematics,
Faculty of Natural Sciences and Education
Lecturers:
Assoc. Prof. Yuriy Kandilarov, PhD, Department of Mathematics, tel. 888 725, e-mail: ukandilarov@uni-ruse.bg
Assoc. Prof. Ivanka Angelova, PhD, Department of Mathematics, tel. 888 587, E-mail: iangelova@uni-ruse.bg
Abstract:
This subject is fundamental for mathematics education in engineering sciences. The goal is to get students acquainted with the basic notions of mathematical analysis, and give them practical computational abilities. Students can use the gained knowledge for further study of higher mathematics – part 3, physics, computer sciences.
Course content:
Definite and Line integrals, Partial derivatives, Differential Equations, Complex Functions, Laplace transform.
Teaching and assessment:
The educational process is realized by lectures and seminars. Lectures present the basic notions and methods for exploring the problems. There is a final written and oral exam at the end of the course.

SB15451 Object-Oriented Programming

ECTS credits: 6
Weekly workload: 2l+0s+2p+1cw
Assessment: exam
Type of exam: written and oral
Department involved:
Department of Computer Systems & Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Emilia Georgieva Golemanova, MEng, PhD, Dept. of CST, tel: 888681,
E-mail: EGolemanova@ecs.uni-ruse.bg
Principal Assistant Tsvetelina Petrova Mladenova, MEng, PhD; Dept. of Computer Systems & Technologies, tel: 888681, E-mail: TsMladenova@uni-ruse.bg
Abstract:
The course objective is for the students to familiarise themselves and to practically assimilate the methodology of object-oriented programming (OOP) as a basis of many modern languages and systems for developing computer applications. The stress is placed on the practical application of the approach by using universal library functions as well as when developing own functions.
Course content:
Introduction to OOP. Classes and objects – definitions. Constructors and destructors. Data members. Member functions. Overloaded functions. Inheritance. Multiple inheritance. Virtual classes. Virtual functions. Polymorphism. Template class library.
Teaching and assessment:
The lecture topics give the main theoretic aspects of the problems. The workshops and course work classes are conducted in a computer lab. The students have to independently solve, encode and test with the aid of a specific programming environment elements of given problems. Each student is assigned an individual task, which they have to complete by the end of the semester. The final mark is a weighted average of four marks: activity during workshops, implementation of the individual task, written report and final exam.

SB15452 Theory of Electrical Engineering

ECTS credits: 7 **Weekly classes**: 3l+0s+2ws +1cw
Assessment: exam **Type of exam**: written
Methodology management:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Boris Ivanov Evstatiev, MEng, PhD, DSc, Dept. of Automatics and Electronics; tel.: 888 371
Abstract
The course Theory of electrical engineering introduces the basic concepts of electromagnetism and energy and information transfer to future engineers in computer and communication technologies. It is the basis for all subsequent courses in electrical engineering and electronics.
Syllabus contents:
Basic laws and theorems in electrical circuits. Analysis of DC circuits. Nonlinear resistors. Analysis of nonlinear DC circuits. Transient processes. Basic laws and theorems in sinusoidal circuits. Sinusoidal steady state analysis. Mutually coupled inductors. Two-port networks. Nonsinusoidal waveforms. Frequency response in electric circuits. Transmission lines. Nonlinear elements in AC circuits.
Technology of teaching:
Lectures present the teaching material according to the syllabus. The continuous assessment includes laboratory exercise reports and a course project assignment. The final mark is formed as a sum of the reports, the course project and the final exam, which is performed in written form.

SB15453 Electrical Measurements

ECTS credits: 4 **Weekly classes**: 2l+0s+0lab +1p
Assessment: continuous assessment **Type of exam**: written test
Methodology management:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Snezhinka Lyubomirova Zaharieva, PhD, Dept. of Automatics and Electronics,
tel.: +359 82 888 382, E-mail: szaharieva@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of Automatics and Electronics, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract
“Electrical Measurements” course has the aim to make the students familiar with the basic methods and devices for electrical and non-electrical quantities evaluating as well as the metrical appraisals and results calculating. Another aim is students to acquire skills and habits which might be needed in measurement schemes realizing and to solve particular problems as well as in students’ activities as forth coming experts – electrical engineers. The knowledge and skills acquired on this module are needed for the students to perceive the particular modules during the tutorials for metrical design ensuring of the technologic and production processes.
Syllabus contents:
Quantitative analysis and quantitative methods; Identification of a measuring method; Identification of a calculating method; A quality of the quantitative appraisals; Electrical and magnetic quantities; Assigning values to the electrical and magnetic quantities; Electrical quantities measuring by immediate comparison; Electrical quantities by mediate comparison; Digital electro-measuring appliances; Appliances for registration and observation; Electrical quantities calculating; Quantitative analysis of non-electrical quantities by electrical methods and devices; System for ensuring the unity of the measurements.
Technology of teaching:
The process of the education on “Electrical Measurements” module consists of lectures and tutorials. Lantern-slides and experimental models might be used as guides.
Normally the tutorials are carried out into cycles. There are four places of work at the hall where on the average three students work together on each of it. The duration of each tutorial is three hours and at the end the students have to prepare a report. During the semester long marking is realized by testing at the time when the tutors are in progress and by periodical test control. The education completes with an exam at the end of second semester. Individual tutorials are carried out regularly at previously announced time for this purpose.

SB15454 Semiconductors

ECTS credits: 6 **Weekly workload**: 2l+0s+2lab+0p+0,5paper
Assessment: exam **Type of exam**: written test
Department involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Ventsislav Petkov Keseev, MEng, PhD; Dept. of Telecommunications; tel.: (+359 82) 888 831; E-mail: vkeseev@uni-ruse.bg;
Assoc. Prof. Ognyan Dinolov, MEng, PhD; Dept. of Electrical Power Engineering; tel.: (+359 82) 888 330; E-mail: odinolov@uni-ruse.bg
Abstract:
The course objective is to familiarize the students with the main active semi-conducting elements used in all electronic and computing devices and tools for communication and automation. The physical principles are studied as well as the structure, characteristics, and parameters of discrete elements – diodes, transistors, tiristors, opto-electronic elements, etc. Specific applications of elements, ways of connection, and methods of operation mode computation are addressed. Brief information about the technology of manufacturing of discrete elements and integrated circuits is given.
Course content:
Electrical materials and physical fundamentals of semi-conductors: conductivity, non-equilibrium state, contact metal-semiconductor; p-n transition. Semiconductor diodes: volt-ampere characteristics of idealised and real diode; breakthroughs in diodes; operation in impulse mode. Operation principle of transistors, main connection circuits, modes of operation and static volt-ampere characteristics; parameters of transistor as a quadruple; frequency properties of transistors; dynamic mode of operation; transistor operation in switch mode. Field transistors: with control p-n transition; MOS- transistors. Tiristors. Optoelectronic elements. Fundamentals of microelectronics: types of integrated circuits; main principles of construction of bi-polar and MOS - integrated circuits.
Teaching and assessment:
The lectures are two hours per week. Each lecture is presented using audio-visual materials. The laboratory exercises are two hours per week. Before the exercise the preparation of students on the theoretical material and the methods for testing is checked. For each exercise students prepare a protocol, which is checked by the lecturer. The results of the assessment during the exercises are taken into account when forming the final mark at the exam. Examination test contents 20 questions.

SB15455 English Language 2

ECTS credits: 2 **Weekly workload**: 0L+0S+0Lab+2P
Assessment: continuous assessment **Type of exam**: written and oral
Department involved:
Department of Foreign Languages,
Faculty Mechanical Engineering
Lecturers:
Sr. Lecturer Mariela Risova, Dep. of Foreign Languages, tel: 082 888816; E-mail: mrisova@uni-ruse.bg
Abstract:
The subject English Part 2 for the degree courses *Computer Systems and Technologies*, *Internet and Mobile Communications and Information and Communication Technologies* comprises 30 hours of classroom work and it extends the foreign language competence of the students to cope with specialised literature and professional communication. Work is done to achieve a greater accuracy in the use of typical and common phrases, structures and grammatical models. Authentic texts are widely used to bring the learners closer to the scientific style. Collocations with frequently used terms and notions are considered. Students prepare and give team presentations.
Course content:
Computer Networks; Cybercrimes; Computers in education; Word processing; Multimedia; Characteristics of the technical text; Job interview; New technologies and Trends in development; History of BBC.
Teaching and assessment:
The practical exercises include the following components: introducing new information; summary and revision; presenting and analysing individually accomplished tasks; knowledge reinforcement through diverse exercises - role-plays, work on authentic texts and in a computer room. Students do two written tests during the semester. The requirements for obtaining a semester validation signature are regular attendance, completing assigned tasks, participating in a team presentation and doing the tests. The final mark is based on continuous assessment.

S03065 Mathematics 3

ECTS credits: 5 **Weekly classes**: 2lec+0sem+0labs+1ws+0,5paper
Assessment: exam **Type of exam**: written
Departments involved:
Department of Applied Mathematics and Statistics.
Faculty of Natural Sciences and Education.
Lecturers:
Assoc. Prof. Iliana Petrova Raeva, MSc, PhD, Dept of Numerical Methods and Statistics, tel.:+359 82 888 466,
E-mail: rk-pms@uni-ruse.bg
Abstract:
The purpose of the course on 3065 Mathematics 3 is to rise students' competence in the sphere of processing and analysis of data from empirical statistical researches, as well as in the sphere of harmonic analysis (electrical fluctuations and signals) for the specific needs of engineering practice.
Course content:
Fourier series, elements of Theory of Probability, Mathematical Statistics, Experiment Planning, Regression and Correlation Analysis.
Teaching and assessment:
The material is presented in lecture classes - the theory is illustrated with many example problems. The practical classes take place in computer labs. They are lead by the teacher as an organized problem solving on a material from the lecture topics. The practical classes include also gaining experience with the software products MATLAB and SPSS. Two control works are taken during the semester - they give the student the opportunity to get their final mark on the course without going on an exam- with minimum marks "Good (4)" on each one of the control works. The course ends up with a written exam and a colloquy with the student if needed.

S03062 Synthesis and Analysis of Algorithms

ECTS credits: 7 **Weekly classes**: 2lec+0sem+0labs+2ps+1ct
Assessment: exam **Type of exam**: written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Tsvetozar Stefanov Georgiev, MEng, PhD, Dept. of CST, tel: 888827, 888711
E-mail: TGeorgiev@ecs.uni-ruse.bg
Assoc. Prof. Emilia Georgieva Golemanova, MEng, PhD, Dept. of CST, tel: 888681,
E-mail: EGolemanova@ecs.uni-ruse.bg
Abstract:
The aim of the subject is to provide students with fundamental knowledge about the theory of algorithms. The students will learn the main algorithms for dynamic data structures processing. The students will be familiarized with the notations as recursion, iteration and asymptotic analysis.
Course content:
Dynamic memory, pointers, dynamic variables. Iteration and recursion. Main data structures – lists, queues, stack, deques, trees and graphs. Algorithms for linear and non-linear data structures processing. Hashing and hash-tables. Asymptotic analysis of algorithms.
Teaching and assessment:
The lectures give the necessary theoretical information about synthesis and analysis of algorithms. The students have specific algorithms to implement on each workshop. The assessment is provided as written and oral exam. The written exam includes theoretical and practical parts. In the first week the course task topics are given out. Each student develops independently one problem and prepares a written report for the work done. The final mark is formed of two marks: mark during workshops and course task (weight 40%) and mark from the final exam (weight 60%).

S03063 Synthesis and Analysis of Logic Devices

ECTS credits: 5 **Weekly classes**: 2l+0s+0lw+2pw+0cw
Assessment: exam **Type of exam**: written
Methodology management:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturer:
Assoc. Prof. Nadezhda Liozovna Evstatieva, MEng, PhD, Dept. of Automatics and Electronics,
tel.: +359 82 888 638, E-mail: nevstatieva@uni-ruse.bg
Abstract
The aim of the course “Logic Design” is to introduce the students to the methods for logic synthesis and analysis. It is necessary the students to have a preliminary knowledge from the course of “Introduction to Communications and Computer Technologies”. The course is a prerequisite for the courses “Digital Electronics”, “Computer Organization” and “Microprocessors”.
Course content:
Boolean algebra objects and manipulation. Axioms and theorems. Boolean functions. Functional completeness. Logic functions and logic gates. Synthesis and analysis of combinational and sequential logic circuits. Synthesis of combinational and sequential process node. Static and dynamic analysis of combinational and sequential logic. Microprogram automaton synthesis.
Teaching and assessment:
The course includes lectures and a practice classes. The lectures are presented with a presentation. The currentassessmentis carried out during the practice classes. There is a 15 minute quiz on the discussed topics during some of the practice classes. The mark of the course is formed by using a point system, after a written exam, which includes theoretical topics from the lectures and individually assigned tasks. The students can get up to 5 point for their participation in the lectures, up to 15 points for their work during the practice classes and up to 80 points for their exam presentation.

S03071 Computer Graphics

ECTS credits: 4 **Weekly workload**: 1lec+0sem+0labs+2ps+1.0ct
Assessment: continuous assessment **Type of exam**: written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Svetlana Petrova Stefanova, MEng, PhD, Dept. of CST, tel: 082 888 356,
e-mail: SStefanova@ecs.uni-ruse.bg
Principal Assistant Elitsa Silyanova Ibryamova, MEng, PhD, Dept. of CST, tel: 082 888 827,
e-mail: EIbryamova@ecs.uni-ruse.bg
Principal Assistant Lachezar Lazarov Yordanov, MEng, PhD, Dept. of CST, tel: 082 888 859,
e-mail: LIordanov@ecs.uni-ruse.bg
Abstract:
The objective of the course is to familiarize students with the main definitions in computer graphics and how a graphic system has to be designed. The aim of the course is to build some practical skills for working with vector and raster-oriented graphic editors.
Course content:
Introduction to computer graphics. Computer graphics types and software products for them. Graphic file formats. Color in computer graphics and graphics color models. Input graphical devices. Output graphical devices. Printing technologies.
Teaching and assessment:
Lectures include the main definitions from the computer graphics area. The students have specific tasks to solve in each practice session, using CorelDraw, Photoshop, Pencil 2D and Blender 3D. There are prepared methodological instructions and specific tasks that should be performed during practical exercises. In the course of the semester, the students gradually build a complete graphical project, enhancing it in each practice session. Each student is assigned two individual tasks, which they have to complete by the end of the semester. The final mark is a weighted average of the following marks: a written short exam and implementation of the individual tasks.

S03079 Programming Languages

ECTS credits: 6 **Weekly classes:** 2l+0s+2ws
Assessment: running **Type of exam**: written
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Georgi Todorov Georgiev, MEng, PhD, Dept. of Computer Systems and Technologies
tel.: +359 (0)82 888744, e-mail: GTGeorgiev@ecs.uni-ruse.bg,
Abstract:
The aims of this course are to generalize the students' knowledge on programming languages; to give them a more in-depth view of fundamental underlying principles and ultimately to facilitate the process of switching to a new programming language. The major programming paradigms are treated in depth in the course - sequential, event-driven, concurrent, functional programming. The problems, inherent to each paradigm are discussed, as well as means of dealing with them. The course introduces modern and popular programming languages such as Java, python and haskell, with the main accent being on Java.
Prerequisites for this course are the following courses: "Programming", "Object-Oriented Programming". It is supposed to be taught in parallel with "Synthesis and Analysis of Algorithms" and "Software Engineering". This course is a prerequisite for "System Programming", and the diploma project, as well as (to a lesser extent) for "Language Processors", "Web Design" and "Web Programming".
Syllabus contents:
Programming languages timeline, definitions, taxonomy. Introduction to the Java programming language. Fundamental programming paradigms - sequential, event-driven, concurrent. Inherent problems and dealing with them. OOP in Java. Structured error-handling. GUI and event handling in Java. Threads in Java. Data storage containers in Java. Introduction to the python programming language. The functional programming paradigm - haskell.
Teaching and learning methods:
The course includes 2 weekly hours of lectures and 2 hours of workshops. The workshops are held in a computer lab with powerful PCs. Two tests are held during the semester. The final mark is based on marks from the two tests, and the work during workshops throughout the semester.

SB15456 Technical English

ECTS credits: 3 **Weekly workload**: 0l+0s+0lab+2p
Assessment: continuous assessment **Type of exam**: written and oral
Department involved:
Department of Foreign Languages
Faculty of Mechanical Engineering
Lecturers:
Sr. Lecturer Mariela Risova, Dep. of Foreign Languages, tel: 082 888816; E-mail: mrisova@uni-ruse.bg
Abstract:
The subject ‘Technical English’ for the degree courses Computer Systems and Technologies, Internet and Mobile Communications and Information and Communication Technologies comprises 30 hours and it extends the foreign language competence of the students with respect to specialised literature and professional communication. Work is done to achieve a greater accuracy in the use of typical and common phrases, structures and grammatical models. Authentic texts are widely used to bring the learners closer to scientific style. Collocations of more frequently used terms and notions are considered. Students prepare and give individual or team presentations related to well-established IT companies or distinguished specialists in the particular professional fields.
Course content:
Distance and e-learning; Electronic publishing; Optical fibers; Web design; Blog descriptions; Computer languages; Jobs in ICT; Video games and videoconferences; Speech technologies, New technologies; Future trends in the development of the computers and telecommunications.
Teaching and assessment:
The practical exercises contain the following components: introducing new information; summary and revision; presenting and analysing individually accomplished tasks; knowledge reinforcement through diverse exercises - role-plays, work on authentic texts and in a computer room. Students are given two written tests during the semester.
The requirements for obtaining a semester validation signature are regular attendance, completing assigned tasks, giving an individual or team presentation and doing the tests. The final mark is based on continuous assessment.

S03067 Databases

ECTS credits: 6 **Weekly classes:** 2l+0s+2ws
Assessment: exam **Type of exam**: written and oral
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Irena Valova, MEng, PhD, Dept. of Computer Systems and Technologies
tel.: +359 (0)82 888685, e-mail: ivalova@ecs.uni-ruse.bg,
Principal Assistant Tsvetelina Petrova Mladenova, MEng, PhD; Dept. of Computer Systems & Technologies,
tel: 888681, E-mail: TsMladenova@uni-ruse.bg
Abstract:
The objective of Databases (DB) course is that the students are acquainted with the database theory and practice, including organization, design, representation, implementation and usage of relational databases. This includes acquiring knowledge of modern technological tools and relevant programming languages for database development and maintenance that are created by leading corporations in this field.
Syllabus contents:
Basic data models. Entity-Relationship model. Relational data model. Converting Entity-Relationship diagrams to relational database schemas. Relational algebra. Anomalies on relations. Normal forms. The new technological tools and relevant programming languages, designed for database development and maintenance. Structured Query Language (SQL). Data Definition language. Data Manipulation Language. Data Query Language. Operators for Grouping and Aggregation of data. Views. NoSQL databases.
Teaching and learning methods:
During the lectures, students are introduced to the theoretical foundations of DB and database structured query language (SQL). The workshops are conducted in a computer lab equipped with modern computers, connected to the Internet. During the practical exercises students learn the theoretical foundations of DB by using web-based interactive learning tools for visualization and interpretation of methods for design, implementation and use of databases. Moreover, students acquire skills and habits to independently create databases and programs for their management. The course ends with an exam. The final grade on course is formed as an average of marks on the practical tasks in the exam and discussions after this, and also current assessment obtained during the semester is taken into account.

S03076 Design Technology

ECTS credits: 4 **Weekly classes:** 1lec+0sem+0labs+2ps+ca
Assesment: continuous assessment **Type of exam:** written
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Aneliya Stoyanova Ivanova, MEng, PhD, Department of CST, tel.: 888 827,
E-mail: AIvanova@ecs.uni-ruse.bg
Principal Assistant Nikolay Genkov Kostadinov, MEng, PhD, Department of CST,
tel.: +359 82 888 674, E-mail: NKostadinov@ecs.uni-ruse.bg
Abstract:
The course objectives are to provide the students with a working knowledge about the hardware design lifecycle and the common approaches to digital systems design.The focus is set to the Hardware Description Languages (HDLs) as a powerful tool to design digital systems and programmable logic as a platform for implementation of the developed designs. In a theoretical aspect the concepts of HDLs are discussed, as well as the levels of abstraction and the components of the models synthesized through HDLs. The structural and behavioral description approaches to model a hardware device are introduced to the students, too. During the course the students develop practical skills to model, synthesize, verify and configure digital systems using Computer Aided Design (CAD) systems and programmable logic devices as Complex Programmable Logic Devices (CPLDs) and Field Programmable Gate Arrays (FPGAs). The developed projects range from basic combinational and sequential logic devices to Finite State Machines and a simplified 8-bit processor.
Course content:
The common approaches to digital systems design are discussed from a theoretical perspective at each level of the design lifecycle – namely system, structural, functional and logical design and physical deployment of the design. A short review of the programmable logic is given to the students, as a hardware base to build their projects. The students are introduced to the concepts of HDLs, in a row with the components of the models synthesized through HDLs. The structural and behavioral description approaches to model a hardware device are analyzed, as well as the verification of projects using test benches. The basic concepts and specifics of the Hardware Verification Languages are subjects to discussion, too.

Teaching and assessment:
The lecture topics introduce to the students the methodology of digital systems design based on HDLs. The lectures are practically oriented and a lot of examples are provided how to design various digital circuits using HDL and programmable logic devices such as CPLD and FHDL. The practice sessions are focused to the full cycle of design and implementation of digital devices and systems using up-to-date CAD tools. Each student gets an individual course assignment, which requires HDL design capture, synthesis, simulation and implementation of a digital device. The final grade is a weighted average of four marks: activity during practice sessions, two tests and implementation of the course assignment. A lot of exemplary projects and additional materials are provided in a WEB based course in order to support the students while developing their course projects.

S03069 Digital Electronics

ECTScredits: 4 **Weekly workload:** 2l+0s+0lab+2p
Assessment: exam **Type of exam**: written test
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, MEng, PhD; Dept. of Telecommunications; tel.: +359 82 888 823;
E-mail: nina@uni-ruse.bg
Assoc. Prof. Adriana Naydenova Borodzhieva, MEng, PhD; Dept. of Telecommunications;
tel.: +359 82 888 734; E-mail: aborodjieva@ecs.uni-ruse.bg
Abstract:
The subject has the objective to familiarize students with the main problems of digital electronics. It links the functions of the digital elements with their microelectronic basis on one hand, and on the other hand – with their application when building pulse and digital devices. Deep knowledge in electrical engineering and semiconductors is necessary. The subject helps to give knowledge in the field of hardware.
Course content:
Forming circuits. TTL integrated circuits. CMOS logic integrated circuits. Triggers. Schmidt triggers. Multi-vibrators. Generators of linear voltage. Impulse circuits with operating amplifiers. Particularities of integrated circuits with middle scale of integration. Interface circuits.
Teaching and assessment:
The lectures give the students the opportunity to get acquainted theoretically with the main questions of digital electronics before the laboratory exercises. The students must be prepared for each workshop and at the end prepare a report for each of them. The exam is held as a written test.

S03070 Computer Organization

ECTS credits: 6 **Weekly classes:** 2lec+sem+0labs+2ps+ca
Assessment: exam **Type of exam:** written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Aneliya Stoyanova Ivanova, MEng, PhD, Department of CST, tel.: 888 827,
E-mail: AIvanova@ecs.uni-ruse.bg
Principal Assistant Orlin Asenov Tomov, MEng, PhD, Dept. of CST, tel.: +359 82 888 276
E-mail: OTomov@ecs.uni-ruse.bg
Abstract:
The objective of the Computer organization course is to familiarize the students with the arithmetic and algorithmic fundamentals of computer circuitry and most of all - with the structure and way of operation of the CPU. The following topics are considered in details: basic building blocks of the processor, structure and way of operation of Arithmetic and Logic Unit, Control Unit, registers, stack, cache, RAM, and interrupt system. The organization of computational process is considered, too. The specifics of the modern processors are also discussed. The course has input links with “Analysis and Synthesis of Logic Circuits” and “Digital Electronics” courses and output links with “Microprocessors”, “Computer peripherals” and “Computer Architectures” courses.
Course content:
Arithmetic basis – counting systems, arithmetic computations, presentation and coding of numerical, symbolic and logical data. CPU - definition, classification, basic building blocks. Structure of the arithmetic and logic unit. Structure of the control unit. Memory structure – registers, stack, cache, RAM. Structure of the interrupt system. Organization of the computational process. Specifics of the modern processors.

Teaching and assessment:
At the lectures the students are familiarized in a theoretic aspect with the methods and algorithms for execution of various operations in computer. At the practical workshops the structure and way of operation of different CPU units and operational blocks are discussed and the students explore the discussed algorithms using interactive software simulators of the basic CPU units and operational blocks. The students take the role of the control unit and set the necessary control signals by clicking the corresponding buttons. During the lectures and workshops the learning content is delivered using modern presentation systems with interactive whiteboards. The course assignment is developed in the virtual laboratory on Computer Organization. The learning process is supported by a WEB based course on Computer Organization in the e-learning platform of the University and by a closed Facebook group, where a lot of video clips on the course subject are published.

S03064 Web Design

ECTS credits: 5 **Weekly classes:** 2l+0s+2ws+1cw
Assessment: running
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Georgi Todorov Georgiev, MEng, PhD; Dept. of Computer Systems and Technologies;
tel.: +359 (0)82 888744; e-mail: gtgeorgiev@ecs.uni-ruse.bg
Abstract:
The course objective is to familiarize the students with the underlying client-side technologies for creating a Web site, to create awareness of W3C standards, to promote good practices for achieving Web content accessibility, usability and credibility.
Syllabus contents:
A short history of Internet. Basic services and WWW. HTML. The need for stricter standards - from HTML to XHTML to HTML5. Separating the document structure from the presentation - CSS. CSS positioning, responsive design. Client-side programming - the ECMAScript / JavaScript language. The Document Object Model (DOM). New features in HTML5. Introduction to HTTP and its usage via ajax. Fundamental design goals of a Web site - accessibility, usability and credibility. Introduction to Search engine optimization (SEO).
Teaching and learning methods:
Lectures are given as multimedia presentations. The workshops are problem-oriented; the students have specific tasks to solve in each workshop, using a simple text editor or Web content creation IDE. In the course of the semester, the students gradually build a complete site, enhancing it in each workshop session. Each student is assigned an individual task, which they have to complete by the end of the semester. The final mark is a weighted average of three marks: activity during workshops, a mid-term test and a final test.

S03072 Data Transmission and Computer Communications

ECTS credits: 5 **Weekly workload:** 2l+0s+0lab+2p
Assessment: ontinuous assessment **Type of exam:** written
Department involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lectors:
Prof. Teodor Bozidarov Iliev, MEng, PhD, Dept. of Telecommunications, tel.: (+359 82) 888 673,
E-mail: tiliev@uni-ruse.bg
Abstract:
This course focuses on the transport of multi-media information among distributed computer systems. We examine how modern communication protocols, as implemented in the Internet, satisfy the differing requirements of the services that generate and use multi-media information.
Course content:
The course contains: OSI history, TCP/IP architecture, Digital Communication, Multiplexing, Successfully Allocating Resources, Encoding Application Data, Securing the Data.
Teaching and assessment:
The lectures clarify the theoretic aspect of the topics and have a sufficient number of examples. This enables the students to prepare in advance for the workshops and to work independently during the classes.
The workshops are held in computer labs. The students do practical work developing, testing and debugging computer networks.

S01841 Practical Training 1

ECTS credits: 3 **Weekly workload**: 3 weeks, 90 hours P
Assessment: **colloquium** **Type of exam**: written and oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Lachezar Lazarov Yordanov, MEng, PhD, Dept. of CST, tel.: +359 82 888 859,
E-mail: LIordanov@ecs.uni-ruse.bg
Abstract:
The purpose of the discipline "Specializing Practice – I" is to introduce the students from the specialty "Computer Sciences and Technologies" to the environment of a real working factory or organization, which is working in the sphere of designing, integrating, manufacturing, running and/or support of the latest computer and office equipment, networks, and informational systems. It takes place in the fourth semester, right after the summer exams.
Course content:
Introduction with the production activity of the company or the organization. Standardized regulation of the system, exploitation, working safety measurements, fire safety and pollution safety. Inside order of the company or the organization. Architecture of the computer systems. Application support. Peripherals and their management. Future upgrade and extending of the computer configurations. Support and maintenance of the computer systems. Operating systems. File organization of data. Running test of the applications installed. Evaluating the applications' quality. Systems for managing data bases. Characteristics and parameters of the peripherals. Computer networks. Architectural special features of the network. Technical means of the network. Network operating system. Methods of access.
Teaching and assessment:
The practice takes place in the time specified according to the study schedule. The classes are in well organized and modernly equipped companies, working in the sphere of electronic manufacturing, developing and support of computer and office equipment. The duration of the specializing practice is 15 working days, 6 hours a day, which means 90 hours. The lectures and the practice are in continuous order. In each working place the students are being instructed with the safety requirements and the specific tasks for the classes. Each student gets a personal practical task. The discipline ends with a colloquium.

S03073 Software Engineering

ECTS credits: 6 **Weekly workload:** 2L+0S+0L+2P+CW
Assessment: exam **Type of exam:** written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Galina Ivanova Ivanova, MEng, PhD, Dept.of CST, tel.: +359 82 888 827,
E-mail: givanova@ ecs.uni-ruse.bg
Principal Assistant Pavel Stoyanov Zlatarov, MEng, PhD, Dept.of CST, E-mail: pzlatarov@uni-ruse.bg
Abstract:
The objective of the Software Engineering course is to familiarize students with the theoretical and practical aspects of the basic approaches of software design, development, testing and software project documentation.
Course content:
Contemporary software development paradigms - Agile methodologies. Software process models. Project management. Software design. User interface design. Software project development. Quality control and assurance. Refactoring. Software application testing. Software project documentation.
Teaching and assessment:
Lectures introduce students to basic theoretical aspects of the software engineering process. Practical sessions provide students with an opportunity to explore the software development process in practice. An examination concludes the course. During the semester, continuous assessment is carried out during classes. If students work systematically and achieve satisfactory results, they can be exempt from the examination.

S03074 System Programming

ECTS credits: 4
Weekly classes: 2l+0s+1ws+a
Assessment: exam
Type of exam: written
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Georgi Todorov Georgiev, MEng, PhD, Dept.of CST, tel.: +359 82 888 744,
E-mail: GTGeorgiev@ecs.uni-ruse.bg
Prof. Tsvetozar Stefanov Georgiev, MEng, PhD, Dept. of CST, tel.: +359 82 888 827,
tel.: +359 82 888 711, E-mail: TGeorgiev@ecs.uni-ruse.bg
Abstract:
The course objective is to give the necessary theoretic knowledge and practical skills to use the system features of PCs running Windows. Some of the topics covered are: optimizing the operation environment, memory managements, multitasking and multithreading. The workshops focus on using the Windows API. The course has input links with the courses: Programming 2, Object-oriented Programming, Computer Organization; parallel links with Microprocessors and Computer Peripherals and output links with Computer Architectures and Operating Systems.
Course content:
Structure and basic modules of Windows. Optimization of the operation environment, Process management, Interrupt and exception handling system, Operating modes of Intel's x86 processors, Specialised modules in Windows, Memory management, Using peripheral ports, Video subsystem, Disk subsystem, Other features (BIOS, POST, Chipsets).
Teaching and assessment:
The course includes 2 weekly hours of lectures and 1 of workshops. The workshops are held in a computer lab with PCs running Microsoft Windows. Two tests are held during the semester. Besides these, every student must prepare a short presentation. The course ends with a final exam. The final mark is based on marks from the two tests, the presentation, and the final exam.

S03075 Microprocessors

ECTS credits: 7
Workload per week: 2l+0s+0lab+2ws+cw
Assessment: exam
Type of exam: written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Nikolov Krastev, MEng, PhD, DSc, Dept.of CST, tel.: +359 82 888 672
E-mail: GKrastev@ecs.uni-ruse.bg
Abstract:
The course “Microprocessors” is compulsory for students of CST. Its objective is to introduce the students to the field of microprocessors, its logical structure and standard extension math coprocessor. The lectures include topics on signals, registers and stack structures, address modes and instruction set. There are discussed parallel and serial I/O, analogue I/O and timer. The programming model and interrupt system are considered. Elements of assembly language are studied.
Course content:
Bus organization of a computer. Main signals and structurec of a processor and coprocessor. Programming model and interrupt system. Elements of assembly language. Addresses and memory. Parallel and serial I/O. Timer. Analog I/O. Applications.
Teaching and assessment:
The lectures are two hours, and the lecture material precedes the workshops. The workshops are two hours each and are conducted every week. At the beginning of each workshop students’ knowledge is checked. The course finishes with an examination. The assessment during workshops allows good students to pass the exam earlier.

SB15457 Discrete Structures and Modeling

ECTS credits: 5 **Workload per week:** 2l+0s+0lab+2ws+cw
Assessment: exam **Type of exam:** written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Irena Marinova Valova, MEng, PhD, Dept. of CST, tel.: +359 82 888 685
E-mail: irena@ecs.uni-ruse.bg
Abstract:
The course "Discrete Structures and Modeling" is mandatory for students in Computer Systems and Technologies.
The course aims to introduce students in "Computer Systems and Technologies" in the theory and practice of systematic modeling, giving them the necessary technological skills to create and explore different types of discrete models for the analysis, synthesis and optimization of complex engineering projects.
Course content:
General information on discrete modeling. Modeling systems of Equations, Sets, Graphs, Petri nets, Discrete and Continuous Markov Chains, Queuing Systems, Pattern Recognition.
Teaching and assessment:
The lectures are one hour per week and are held for two hours every other week. Lectures are associated with exercises. The exercises are two hours and are held in the computer lab every week. Every exercise starts with test to check students knowledge on the material.

S03077 Computer Peripherals

ECTS credits: 4 **Workload per week:** 1l+0s+0lab+2ws+A
Assessment: exam **Type of exam:** written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Nikolov Krastev, MEng, PhD, DSc, Dept.of CST, tel.: +359 82 888 672
E-mail: GKrastev@ecs.uni-ruse.bg
Principal Assistant Latchezar Lasarov Iordanov, MEng, PhD, Dept. of CST, tel. +359 82 888 859
E-mail: liordanov@uni-ruse.bg
Abstract:
The Computer Peripherals subject is compulsory for CST course students. Its objective is to introduce the students to the field of computer peripherals. The lectures include topics on I/O devices, secondary storage and systems, as well as peripheral interfaces.
Course content:
Introduction to computer peripherals. Input Devices. Output Devices. Visualisation Devices. Peripheral Interfaces.Secondary Storage Devices and Systems.
Teaching and assessment:
The lectures are delivered by two hours every week of the first semester half. The workshops are two hours each, conducted every week. Defended reports for workshops done and personal assignment report, publicly presented and defended, forms student’s portfolio on the subject. The course finishes with an examination. Students with very good or excellent results from the assessment of their work done during semester can be released from the examination.

S03078 Integrated Development Environment

ECTS credits: 4 **Weekly workload:** 1L+0S+2P+1CW
Assessment: continuous assessment **Type of exam:** written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Elitsa Silyanova Ibryamova, MEng, PhD, Dept. of CST, tel: 888827,
E-mail: eibryamova@ecs.uni-ruse.bg
Assoc. Prof. Galina Ivanova Ivanova, MEng, PhD, Dept.of CST, tel.: 888 855,
E-mail: giivanova@uniruse.bg
Abstract:
The aim of this course is students to acquire knowledge on the fundamental principles of the integrated development environments working. Furthermore, main components for rapid development of software systems and characteristics of object-oriented and visual programming are presented in the course. This objective is achieved by introducing the general features of the underlying integrated environments on the lectures. The main topics of workshops include development of projects, interfaces, dialog windows, controls, graphic functions, standard dialogs and etc.
Course content:
Overview and classification of integrated development environments, comparative analysis. Fundamental components of integrated development environments. Working with IDE: creating project, settings, visual components, attributes, methods. Static libraries, dynamic libraries, forms, services, etc. Architecture of selected integrated environment. Authentication and authorization.
Teaching and assessment:
The theoretic aspects of the topics are covered on lecture classes. Students have the opportunity to put into practice their theoretical knowledge during the workshops. The tasks, that are given at the workshops, are problem-oriented and students could choose to work in different integrated development environment. Each student is assigned an individual task at the first two weeks. The final mark includes written theoretical and practical part, and an oral examination. The final mark is based on activity during workshops, implementation of the individual task and two tests during the semester.

SB15458 Cryptography and Data Security

ECTS credits: 6 **Workload per week:** 2L+ 0OS+0LAB+2P+CW
Assessment: exam **Type of exam:** written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Emilia Georgieva Golemanova, MEng, PhD, Dept. of CST, tel.: +359 82 888 681,
E-mail: EGolemanova@ecs.uni-ruse.bg
Abstract
The course Cryptography and data security is compulsory for students of CST. Its objective is to introduce the students to the field of cryptology. The lectures include topics on classical cryptosystems, cryptography protocols, techniques and algorithms - conventional and modern symmetric encryption, stream ciphers and pseudo random numbers, public-key cryptography, Hash function etc. The goals of the course are a well-rounded theoretical knowledge of the most important aspects of these topics, together with implementation of some cryptosystems in software.
Course content:
Foundations of cryptography and security, Basic Mathematic in Cryptography. Cryptography protocols and techniques, Classical and modern encryption algorithms – Data encryption standard, stream and block ciphers, public-key encryption, pseudo random generators, one-way Hash functions, RSA, AES and Elliptic Curve Cryptography etc.
Teaching and assessment:
The lectures are two hours, and the lecture material precedes the practical shops and course work. The practical shops are one hours per week and are conduct two hours at intervals of a week. At the beginning of each practical shop students' knowledge is checked. The course finishes with an examination. The assessment during semester allows students to receive regular knowledge.

S03082 Computer Architectures

ECTS credits: 6 **Weekly classes:** 2lec+0sem+0labs+2ws
Assessment: exam **Type of exam:** written
Responsible department:
Department of Computer Systems and Technologies,
Faculty of Electrical Engineering, Electronics and Automation
Lectors:
Principal Assistant Nikolay Genkov Kostadinov, MEng, PhD, Dept. of CST, tel.: +359 82 888 674,
E-mail: NKostadinov@ecs.uni-ruse.bg
Abstract:
The course addresses architectural aspects of computer systems. Main terms and principles in computer architectures are discussed as well as organization of computations. Modern computer architectures are presented analytically and comparatively. The instructions pipeline and its control is subject of special attention. The three main architectures (accumulator, stack, register) are discussed, as well as the IA-32 architecture, the DLX architecture of RISC type, memory hierarchy and input-output subsystem structure.
Course content:
Computer architecture principles. Historical perspective. Types of computer architectures. Computer system base structure. Principles, laws and equations of computer performance. Organization of the computations. Accumulator, stack and register architecture. Architecture IA32. Working modes. RISC architecture DLX. Instruction level parallelism. Computer memory hierarchy. Input-output system.
Teaching and assessment:
The lectures introduce main theoretical topics. Each group of lectures ends with conclusion of material and formulation of problems. At the workshops simulations and real systems are used putting lectures to practice. Each workshop begins with formulation and analysis of problems. At the very end the students are asked to summarize in written form their results. The information materials needed are given in electronic form to all of the students.

SB15459 Computer Reliability and Security

ECTS credits: 6 **Weekly workload:** 2L+0S+2P+1CW
Assessment: exam **Type of exam:** written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lectors:
Assoc. Prof. Galina Ivanova Ivanova, MEng, PhD, Department of CST, tel.: 888 827,
E-mail: givanova@ecs.uni-ruse.bg
Principal Assistant Pavel Stoyanov Zlatarov, MEng, PhD, Dept.of CST, E-mail: pzlatarov@uni-ruse.bg
Abstract:
The course "Computer Reliability and Security" aims to acquaint students majoring in "Computer Systems and Technologies" both theoretically and practically with the basic methods of improving the reliability of computer systems (CS), with different types of codes and their use for detection and correction of errors in the CS, with the types of faults and methods for generating control and diagnostic tests, with the main methods and tools for testing computer systems, as well as with basic concepts and standards for security of computer systems and networks and the information processed by them.
Course content:
Control of computer systems. Coding theory. Parity control. Hamming code - simple and matrix assignment. Cyclic codes. Code with control by module 3. Equilibrium and two-dimensional codes. Diagnostic control of computer systems. Continuous control in computer systems. Memory and processor testing. Testing of motherboards and video cards. Performance tests. Diagnostics of computer systems. Generating tests for combinational and sequential circuits. Reliability of computer systems. Reliability theory. Reservation. Fault tolerance. Computer security. Essence of computer security. Types of threats. Data access control and confidentiality. Internet security. Introduction to virtualization. Reliability and security of virtualized systems.
Teaching and assessment:
The lectures acquaint students in theoretical terms with the main issues related to reliability and methods for improving it, with the main issues of diagnostics and the main methods and tools for testing, as well as with the basic concepts and standards of computer security.
The practical exercises are held in a hall equipped with the necessary hardware and software and provide an opportunity to explore some control methods using different codes, to acquaint students with PC testing programs and to explore tools and scenarios related to computer security. At the beginning of some of the practical exercises, time is devoted to solving problems related to the calculation of reliability, coding and decoding using different codes, as well as the generation of tests for both combinational and sequential circuits.
The course ends with an exam. Continuous assessment is carried out during the semester. In case of shown systematic work by the students and good results from the assessments, exemption from the exam is granted.

S03105 Economics

ECTS credits: 4 **Weekly workload: 2**l+1s+0lab+0pe
Assessment: continuous assessment **Type of exam:** written
Departments involved:
Department of Economics
Faculty of business and management
Lecturers:
Assoc. Prof. Natalya Nedelcheva, PhD, Dept. of Economics and International Relations, tel.: +359 82 888 416, E-mail: nnedelcheva@uni-ruse.bg
Abstract:
The subject is concerned with the general problems, laws and categories of the contemporary market economy. Thus it creates a certain basis for the remaining economic objects. It also gives general knowledge, which is expressed in alternative ways of economic viewing and which forms and creates abilities for independent and expert choice in economic surroundings. Course prerequisite is knowledge of mathematics and it is related to concrete branch and functional economic subjects.
Course content:
Introduction – the economic system and the fundamentals of economic theory.
Market mechanism. Public sector. Consumer demand and behavior. Manufacture, company assets and expenses. Imperfect competition and supplying. Price formation and incomes depending on production factors: Gross domestic product and economic growth. Economic cycles, unemployment and inflation. Taxation, budget and monetary policy.
Teaching and assessment:
Material is taught in two ways – lectures and practical classes, which elucidate and develop further some of the issues discussed at lectures. Continuous assessment is carried out. It includes two test assignments and student performance during the semester. Final assessment is the average of the above-mentioned components of evaluation.

SB15460 Project

ECTS credits: 2 **Weekly workload:** course project
Assessment: defence of course project **Type of exam:** written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lectors:
Assoc. Prof. Galina Ivanova Ivanova, MEng, PhD, Department of CST, tel.: 888 827,
E-mail: givanova@ecs.uni-ruse.bg
Principal Assistant Pavel Stoyanov Zlatarov, MEng, PhD, Dept.of CST, E-mail: pzlatarov@uni-ruse.bg
Annotation:
The purpose of the course is to consolidate the theoretical and practical knowledge acquired in the fifth semester through independent work on a given topic from the studied material. Also, students acquire skills for documenting and presenting their work.
Course content:
The content of the course covers theoretical and practical material about what was studied in the fifth semester.
Teaching and assessment:
Each student receives an individual assignment. Prepares a report on the theoretical statements, main tasks and algorithms in the relevant field. It details at least one of the algorithms it implements programmatically. Prepares a presentation of the theoretical and practical part of the project. The final grade is the arithmetic mean of the grades of the report, the practical implementation and the presentation.

SB15461 Computer Systems Design

ECTS credits: 6 **Weekly classes**:2l+0s+2ws+cw
Assessment: continuous assessment mark
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Nikolov Krastev, MEng, PhD, DSc, Dept.of CST, tel.: +359 82 888 672
E-mail: GKrastev@ecs.uni-ruse.bg
Principal Assistant Nikolay Genkov Kostadinov, MEng, PhD, Dept. of CST, tel.: +359 82 888 674,
E-mail: NKostadinov@ecs.uni-ruse.bg
Abstract:
The course objectives are to provide students with a working knowledge required to design computer systems based on popular microprocessor families. Topics include organization of basic computer modules and CPU interaction with RAM, ROM and Input/Output.
Course content:
Computer systems design stages. Computer buses. Computer modules design: CPU, memory subsystems (RAM, ROM), Input/Output. Applications.
Teaching and assessment:
The lecture topics are practically oriented and coordinated with workshops The workshops are focused on the actual design of computer modules using CAD tools and chips documentation. Each student gets an individual course work task, which requires design of a particular computer module interfaced to standard bus. The final mark is a weighted average of four marks: activity during workshops, two control works and implementation of the course work.

SB15462 Artificial Intelligence

ECTS credits: 5 **Weekly classes:** 2l+0s+2ws+cw
Assessment: continuous assessment mark
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Svetlana Petrova Stefanova, MEng, PhD, Dept. of CST, tel.: +359 82 888 356,
E-mail: SStefanova@ecs.uni-ruse.bg
Assoc. Prof. Emilia Georgieva Golemanova, MEng, PhD, Dept. of CST, tel.: +359 82 888 681,
E-mail: EGolemanova@ecs.uni-ruse.bg
Abstract:
The objective of the course is to familiarize students with the theory of the artificial intelligence systems and to help them acquire the practical skills needed for the design, development and application of such systems. Course prerequisites: Synthesis and Analysis of Algorithms, Discrete Structures and Modeling.
Course content:
Introduction into artificial intelligence. Definition and analysis of problems. Solving problems represented in a state space. Solving problems with a reduction. Knowledge representation. Planning.
Teaching and assessment:
The lecture topics give the main theoretic aspects of the problems. The practical sessions are conducted in a computer lab. The students have to independently solve elements of given problems. The final mark is formed on the basis of the practical session mark, course task mark and results of the tests.

S03086 Practical Training 2

ECTS credits: 4 **Weekly workload**: 4 weeks, 120 hours P
Assessment: colloquium **Type of exam**: written and oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Lachezar Lazarov Yordanov, MEng, PhD, Dept. of CST, tel.: +359 82 888 859,
E-mail: LIordanov@ecs.uni-ruse.bg
Abstract:
The purpose of the discipline “Specializing Practice – II” is to help the students from the specialty “Computer Sciences and Technologies” assimilate the knowledge and skills gained by the time of the practice. Gaining new specific skills within the environment of a real working factory or organization, which is working in the sphere of designing, integrating, manufacturing, running and/or support of the latest computer and office equipment, networks, and informational systems. It takes place in the sixth semester, right after the summer exams.
Course content:
Introduction with the production activity of the company or the organization. Standardized regulation of the system, exploitation, working safety measurements, fire safety and pollution safety. Inside order of the company or the organization. Architecture of the computer systems. Application support. Peripherals and their management. Future upgrade and extending of the computer configurations. Support and maintainance of the computer systems. Operating systems. File organization of data. Running test of the applications installed. Evaluating the applications' quality. Systems for managing data bases.
Teaching and assessment:
The practice takes place in the time specified according to the study schedule. The classes are in well organized and modernly equipped companies, working in the sphere of electronic manufacturing, developing and support of computer and office equipment. The duration of the specializing practice is 20 working days, 6 hours a day, which means 120 hours. The lectures and the practice are in continuous order. In each working place the students are being instructed with the safety requirements and the specific tasks for the classes. Each student gets a personal practical task. The discipline ends with a colloquium.

S03087 Web Programming

ECTS credits: 5 **Weekly classes:** 2l+0s+2ws+0cw
Assessment: exam
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Yordan Kalmukov, MEng, PhD. tel.: +359 (0)82 888 681, JKalmukov@ecs.uni-ruse.bg
Assoc. Prof. Irena Valova, MEng, PhD, tel.: +359 (0)82 888 685, IValova@ecs.uni-ruse.bg
Principal Assistant Tsvetelina Mladenova, MEng, PhD, tel.: +359 (0)82 888 681, Tsmladenova@uni-ruse.bg
Abstract:
The course aims to provide students an in-depth theoretical knowledge and practical skills to design and develop web applications and web services.
Course content:
During lectures students learn the basic principles of operation of web services and web applications, their typical architectures and communication protocols. Teaching materials present alternative approaches to design and development scalable, multi-tier, module-organized web applications that provide functional and physical separation of business logic from the user interface and from the data. An attention is paid to all security issues as well, including methods of protecting web applications from an unauthorized access and common hacker attacks. Methods for collecting and storing data from IoT devices, the application of machine learning in web programming, and specific methods for testing web applications are discussed as well.
During the practical exercises students develop a complete web-based information system that provides the most common basic functionalities – user registration and authentication; add, edit and delete data; and etc. The system is implemented as a multi-tier module-organized application in accordance with the MVC architectural pattern. Subsequently, additional functionalities for collecting, storing and analyzing data from IoT devices are also added to it.
Teaching and assessment:
Teaching consists of lectures and practical exercises. The course finishes with a practical examination, where every student should develop a web application. Student’s final grade is based on his/her results from the practical examination and his/her work during the exercises.

S03088 Operating Systems

ECTS credits: 6 **Weekly workload**: 2l+0s+2p+1cw
Assessment: exam **Type of exam**: written
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Tsanko Dimitrov Golemanov, MEng, PhD; Dept. of CST, tel.: +359 82 888
E-mail: tgolemanov@ecs.uni-ruse.bg
Abstract:
The course aims at familiarizing the students with the practical aspects of the organization, structure and use of operating systems (OS). This aim is achieved through a comparative analysis of the main components of three different types of OS – single-user single-tasking, single-user multi-tasking, multi-user multi-tasking.
Course content:
OS classification, definitions.OS progress. OS structure – kernel, user interface, system programs. Processes – definition, life cycle. Concurrent processes. Mutual exclusion. Deadlock. Processor management. Memory management – management methods, virtual memory. File system management. Protection and safety in OS.
Teaching and assessment:
The lecture topics give the main theoretic aspects of the considered problems. The workshops are conducted in a computer lab. In some of the workshops the students study the main commands of the corresponding OS, and in the other workshops simulation programming environments are used to explore and study the OS. Each student is assigned an individual task, which they have to complete by the end of the semester. The final mark is a weighted average of four marks: activity during workshops, implementation of the individual task, written report and final exam.

SB11276 Computer Networks

ECTS credits: 6 **Weekly workload**: 2l+0s+2p
Assessment: exam **Type of exam**: written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Nikolov Krastev, MEng, PhD, DsC, Dept. of CST, tel.: +359 82 888 672
E-mail: gkrastev@ecs.uni-ruse.bg
Abstract:
The course objective is to familiarize students with the principles and ways of connecting computers in networks as well as with the implementation of intercommunication between different levels of connections.
Course content:
The course topics are related to: devices and topologies used in computer networks; physical means and characteristics of distance data transfer: cables, optic and wireless connections; standard model and networks types: channel commutation, messages and packages; connecting channel management and transfer reliability, sequences and protocols; data exchange routine in networks with multiple nodes and streams management, routine algorithms; protocol system TCP/IP – addressing, formats and structures; network and transport protocols, routines in IP networks; domain name system (DNS) and maintenance in Internet, file transfer, e-mail and Web technologies in Internet; data security and authenticity in networks.
Teaching and assessment:
The lecture topics give the main theoretical aspects of the course problems. Multimedia presentations are used to introduce the lecture material. The workshop sessions are carried out in halls equipped with personal computers and relevant specialized hardware and software for implementing the course researches. During the workshops students are able to practically apply the acquired theoretical knowledge. For each workshop students are provided with methodical instructions and relevant tasks for implementing. The course ends with written exam and oral testing.

SB11277 Multimedia Systems and Technologies

ECTS credits: 4 **Weekly classes**: 2l+0s+1ws
Assessment: continuous assessment mark **Type of exam:** written
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Tsvetozar Stefanov Georgiev, MEng, PhD, Dept. of CST, tel.: +359 82 888 827,
tel.: +359 82 888 711, E-mail: TGeorgiev@ecs.uni-ruse.bg
Abstract:
The objective of the course "Multimedia Systems and Technologies" is to familiarise students with the technology to create multimedia products, comprising text, graphic, audio and video objects according to a scenario prepared in advance, as well as with the structure of the systems for developing and recreating such products. The course examines basic graphic, sound and video file formats and compression methods and the use of some popular authoring systems. The course has input links with the courses Programming Languages, Web design, Computer Peripherals, and parallel with Program technologies for Internet.
Course content:
Multimedia – history, definitions, application area. Technology of creating multimedia products. Systems for developing multimedia products. Methods and tools for creating, editing and saving text objects. Methods and tools for creating, compressing, editing and saving graphic objects. Methods and tools for creating, compressing, editing and saving audio objects. Methods and tools for creating, compressing, editing and saving video objects. Assembling, testing and distribution of multimedia applications. Video-conferencing systems.Virtual reality.
Teaching and assessment:
The lectures familiarise students in theory with the main problems of creating multimedia products. The workshops allow each student to develop multimedia objects and include in multimedia product following a given scenario. The students must develop multimedia course project based on the given task. The assessment is continuous. The final mark is the average of the marks of two tests, personal participation in class works and the mark of the course task.

SB11278 Computer Systems for Control

ECTS credits: 4 **Workload per week:** 1L+ 0 OS+0LAB+2P+CW
Assessment: exam **Type of exam:** written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Orlin Asenov Tomov, MEng, PhD, Dept. of CST, tel.: +359 82 888 276
E-mail: OTomov@ecs.uni-ruse.bg
Annotation:
The aim of the course is to provide the students with knowledge for the steps of the development process of a dedicated microprocessor controllers. It is focused on the main building blocks of the controllers, starting with the power supply block, sensors selection, signal filtration and matching, linearization, commutation blocks, communication interfaces and others.
Course content:
Development of power supply modules; methods for signal filtering and matching; sensors – types and characteristics; commutation devices – characteristics and development; PID control – realisation and fine tunning; interfaces – RS232, RS422, RS485, MODBUS; CAD systems.
Teaching and assessment:
The lectures give the necessary theoretical information about the hardware design. At the workshop the students are developing and testing different modules using a SPICE simulator The assessment is provided as written and oral exam. The written exam includes theoretical and practical parts. In the first week the course papers topics are given out. Each student develops independently one problem and prepares a written report.

SB15465 Single-chip Microcontrollers

ECTS credits: 5 **Weekly classes**: 2l+2ps+1cw
Assessment: continuous assessment mark **Type of exam**:
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturer:
Principal Assistant Orlin Asenov Tomov, MEng, PhD, Dept. of CST, tel.: +359 82 888 276
E-mail: OTomov@ecs.uni-ruse.bg
Abstract:
The aim of the subject is to provide students with fundamental knowledge about one of the most popular family of embedded microcontrollers – MCS51. The students will learn the structure of some of the architecture, some systems for development and their main features and functionalities.
Course content:
Main features of the MCS51 family. Architecture. Memory organization. Instruction set. Paralel ports.Serial ports. Displays. Timers/Counters. ADC. PWM. Networks of Microcontrollers.
Teaching and assessment:
The lectures give the necessary theoretical information about the hardware design. The students have specific tasks for software development on each workshop. For this purpose, development boards based on AT89C51AC3 and P80C552 MCUs are provided for each student. At the beginning of each workshop, an evaluation of the students knowledge is performed. In the first week the course task topics are given out. Each student develops independently one problem and prepares a written report.

SB15464 Information Systems

ECTS credits: 4 **Weekly workload**: 1l+0s+2p+1cw
Assessment: exam **Type of exam**: written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Tsanko Dimitrov Golemanov, MEng, PhD; Dept. of CST, tel.: +359 82 888
E-mail: tgolemanov@ecs.uni-ruse.bg
Abstract:
The course objective is to familirise students with the main stages in the design and development of information systems (IS) as well as with the practical aspects of applying the OOP approach to the information systems development.
The course has input links with: “Programming Languages”, “Software Engineering”, “Object-oriented programming”, “Databases”; and “Programming Environments”.
Course content:
Main problems of the IS. Life cycle of IS development using a structural approach. Structural analysis and design. Building data-flow diagrams. Organization and methods for designing codes and classifiers. Object-oriented (OO) analysis and design of IS. OO design of input and output documents. Design and organization of IS user interface. IS management. Methods for software protection. IS documenting. Geographic information systems.
Teaching and assessment:
The lecture topics give the main theoretic aspects of the considered problems. The workshops are conducted in a computer lab. The students should independently solve, code and debug entirely or partially defined elements with the aid of a corresponding programming environment. Students’ work is evaluated at each workshop.

S03094 Language Processors

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ps+1cw
Assessment: continuous assessment **Type of exam:** written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturer:
Assoc. Prof. Aneliya Ivanova, MEng, PhD, Department of CST, tel.: 082 888 827,
E-mail: aivanova@ecs.uni-ruse.bg
Principal Assistant Tsanko Golemanov, MEng, PhD, Department of CST, tel.: 082 888 681,
E-mail: tgolemanov@uni-ruse.bg
Abstract:
The objective of the “Language processors” course is to familiarize the students with the fundamental concepts of design, implementation and deployment of language processors, particularly compilers as their most commonly used representatives.
The course has input and output links with the courses “Programming”, “Programming Languages”, “Synthesis and Analysis of Algorithms”, “Discrete Structures and Modelling”, and “WEB Programming”.
Course content:
The theory of formal grammars and languages is introduced. The translation phases are discussed and compiler architecture is described. The most commonly used approaches for lexical, syntax, and semantics analysis, code generation and optimization are presented.
Teaching and assessment:
At the lectures the students are familiarized in a theoretic aspect with the mechanisms for generation and recognition of formal languages, with the architecture of compilers and the translation phases, intermediate-code representation of the input data and techniques for building a compiler. At the practical workshops the students, grouped in teams and monitored by a supervisor perform the labs and practice sessions. The final mark is complex and takes into account the the grades from the theoretical and practical evaluation and the course project’s grade.

SB11283 Local Area Networks

ECTS credits: 4 **Weekly workload**: 2L+0S+3P
Assessment: exam **Type of exam**: written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Nikolov Krastev, MEng, PhD, DSc, Dept. of CST, tel.: +359 82 888 672.
E-mail: gkrastev@ecs.uni-ruse.bg
Abstract:
The course provides knowledge, concepts and skills required for the creation, configuration, setting up and administration of local area networks. During the workshop sessions students get concrete practical skills from relevant subject area.
Course content:
Passive and active equipment of local area networks (LAN). Building of LAN. Structuring and segmenting of LAN. Network environment of OS. Protocols and network services. Monitoring of events and access to network resources. Remote access. Internet and intranet. Network security. Wireless networks.
Teaching and assessment:
The lecture topics give the main theoretical aspects of the course problems. Multimedia presentations are used to introduce the lecture material. The workshop sessions are carried out in halls equipped with personal computers and relevant specialized hardware and software for implementing the course researches. During the workshops students are able to practically apply the acquired theoretical knowledge. For each workshop students are provided with methodical instructions and relevant tasks for implementing. The course ends with written exam and oral testing.

SB11284 Computer Telecommunication Systems

ECTS credits: 4 **Weekly classes**: 2l+0s+3ws+0cw
Assessment: running
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Nikolay Genkov Kostadinov, MEng, PhD, Dept. of CST, tel.: +359 82 888 674,
E-mail: NKostadinov@ecs.uni-ruse.bg
Abstract:
The course objective is to introduce students to two classes of applications of computer systems in telecommunications.
The first topic focuses on the application of embedded processors for wireless communications to build 'machine-to-machine' systems. Emphasis is placed on the wireless processors' architecture, software components, and communication services provided by the OS API layer.
The second main topic covers the principles of computer telephony (VoIP). Main attention is paid to methods of compression and coding of audio/video data, IP signaling protocols used to interwork with other telephony systems, as well as Quality of Service (QoS).
Course content:
Formal methods for communication protocol specification. Processors for wireless communications. Open AT OS mobile operating system. Open AT OS communication services. Internet and TCP/IP plug-in. Principles of computer telephony (VoIP). Coding and compression of audio/video signals. Transport protocols for multimedia communication. Signaling protocols. Quality of Service (QoS).
Teaching and assessment:
Teaching consists of lectures and workshops. At the workshops, students develop their own "machine-to-machine" GSM/GPRS applications, as well as configure and evaluate various IP telephony applications. The final mark is based on marks from two tests, and the student's work during workshops throughout the semester.

SB11285 Image Processing and Computer Vision

ECTS credits: 4 **Weekly classes**: 2l+0s+3ws+0cw
Assessment: running
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Irena Valova, MEng, PhD; Dept. of Computer Systems and Technologies;
tel.: +359 (0)82 888 685, E-mail: IValova@ecs.uni-ruse.bg
Assoc. Prof. Yordan Kalmukov, MEng, PhD; Dept. of Computer Systems and Technologies;
tel.: +359 (0)82 888 827, E-mail: JKalmukov@ecs.uni-ruse.bg
Principal Assistant Tsvetelina Mladenova, MEng, PhD; Dept. of Computer Systems and Technologies;
tel.: +359 (0)82 888 827, E-mail: TsMladenova@ecs.uni-ruse.bg
Abstract:
The course aims to introduce students to the basic methods and algorithms for digital image processing and computer vision. Teaching materials focus on both preliminary image processing (geometric transformations, noise reduction, edge detection, image morphology and etc.) and the subsequent feature extraction and pattern recognition.
Course content:
The course focuses on the basic methods and algorithms for: enhancing image quality; digital filtering; noise reduction; edge and feature detection; image morphology; hit-and-miss transform for "pixel-level" pattern detection; thinning, thickening and skeletonization of objects; determining convex hull or zone of influence; connected components segmentation and labeling; contour extraction and analysis; pattern recognition and etc.
Teaching and assessment:
Teaching consists of lectures and practical exercises. On lectures students are introduced to theoretic research and formal definitions of methods and algorithms for image processing and pattern recognition. The teaching material is supported by suitably chosen real-life examples. During the practical exercises students analyze some additional examples then implement the relevant algorithms and use them to solve specific tasks. Student's final grade is based on his/her result from solving two examination tests during the semester and his/her work during the exercises.

SB11286 Real-time Systems

ECTS credits: 4 **Weekly classes**: 2l+0s+3ws+0cw
Assessment: exam **Type of exam**: written
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Nikolay Genkov Kostadinov, MEng, PhD, Dept. of CST, tel.: +359 82 888 674,
E-mail: NKostadinov@ecs.uni-ruse.bg
Abstract:
The course objective is to introduce students to the fundamental principles of real-time systems and to provide them with hands-on experience in designing and developing a real operational system. The main programming languages intended for real-time systems are examined. The basics of tasks and dispatching are studied. Much attention is devoted to common approaches to real-time scheduling. Mechanisms provided to meet timing constraints, as well as the methodology of developing real-time applications, are discussed.
Course content:
Overview of real-time applications and concepts. Languages developed for real-time programming. Hierarchical levels. Task management and dispatching policies. Real-time scheduling. Inter-task communication and synchronization. Event processing mechanism. Reliability and fault tolerance.
Teaching and assessment:
The lectures cover the main theoretical principles of real-time systems. To obtain a broad understanding, the examination of the basic principles is accompanied by examples from popular real-time systems. The laboratory is equipped with real-time development tools and specific microcontroller-based boards. During the workshops, students conduct experiments on an open-source real-time operating system.

SB11287 Parallel Computer Systems

ECTS credits: 4 **Weekly classes:** 2lec+0sem+0labs+3ws
Assessment: exam **Type of exam:** written
Responsible department:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lectors:
Principal Assistant Nikolay Genkov Kostadinov, MEng, PhD, Dept. of CST, tel.: +359 82 888 674,
E-mail: NKostadinov@ecs.uni-ruse.bg
Abstract:
Architectural aspects of parallel computer systems as separate class of computer architectures are addressed. The requirements of parallel computer structures are formulated at the very beginning. The classification of such systems is given. Canonical structures and topologies are defined as well.
The communicating sequential processes CSP of C.A.R. Hoare is used as base parallel computing model.
Three main practical implementations of the CSP model are given – single node environment with multitasking (platform Windows/x86, executive environment fiberOS/CSP, programming language C), conventional multi node environment with multitasking (platform X51/MCS51, executive environment X51m, programming language C) and multi node hardware environment with direct architectural support of parallelism (SMT/DLP kernel XCORE, parallel programming language XC). Special attention to the organization of communication subsystem and inter-node communication primitives is given.
Course content:
General terms. Classification of parallel computer systems. Canonical structure of parallel computer system. Examples of MIMD systems. Regular computing structure. SMT/DLP chip multiprocessors.
Teaching and assessment:
The lectures introduce main theoretical topics. Each group of lectures ends with conclusion of material and formulation of problems.
At the workshops real systems are used putting lectures to practice. Each workshop begins with formulation and analysis of problems. At the very end the students are asked to summarize in written form their results.
The necessary informational materials and developing tools are provided to the students through cloud computing resources.

SB15466 Distributed Web Applicationss

ECTS credits: 4 **Weekly workload**: 2L+0S+3P+0CW
Assessment: exam **Type of exam**: written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Yordan Kalmukov, MEng, PhD. tel.: +359 (0)82 888 681, JKalmukov@ecs.uni-ruse.bg
Abstract:
The course aims to provide students an in-depth theoretical knowledge and practical skills to design, develop and integrate distributed web applications.
Course content:
During lectures, students learn about: the basic principles of operation of distributed web applications; the need to distribute data and computations; integration and scaling of web applications; service-oriented architecture (SOA); methods of separation of programming interface from implementation; languages and technologies used to formally describe data and programming interfaces of web services; communication protocols between services; and methods for management and coordination of web services.
During the practical exercises, students have to implement a distributed heterogeneous web-based system. At the beginning, all students, together with the tutor, choose a subject domain, formulate system requirements, identify the individual web services that could build the entire system, and formally describe their programming interfaces and the data they will exchange. Then students are divided into small teams, with each team developing one of the designated web services and testing (autonomously) its functionality. Finally, all teams together, integrate the web services they have developed and perform an integration testing of the entire distributed system.
Teaching and assessment:
Teaching consists of lectures and practical exercises. During exercises, students work both in small teams and all together to design and implement an entire heterogeneous distributed system. The teacher monitors and evaluates their work, and the received grade has a weight of 30% on the final grade. The subject ends with a written exam, which gives the remaining 70% of the final grade.

SB11289 Computer Graphic Systems

ECTS credits: 4 **Workload per week:** 2 l+0 s+0 lab+3 p+0CA
Assessment: exam **Type of exam:** written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Svetlana Petrova Stefanova, MEng, PhD, Dept. of CST, tel.: +359 82 888 356,
E-mail: SStefanova@ecs.uni-ruse.bg
Principal Assistant Elitsa Silyanova Ibryamova, MEng, PhD, Dept. of CST. tel.: +359 82 888 827,
E-mail: EIbryamova@ecs.uni-ruse.bg
Abstract:
The objective of the Computer Graphical Systems course is the extension of the students' knowledge in the design of graphical systems. The course aims to provide the theoretical knowledge and skills for working with graphical libraries in coding main algorithms for vector and raster graphics.
Course content:
Architecture of a graphics system. Tools for developing computer graphics systems. Basic elements in developing graphics systems. Graphical object models. Transformations. Algorithms for drawing graphic objects in raster form. Algorithms for 2D cutting. Algorithms for removing hidden lines. Algorithms for generation of filled areas. Parametric cubic curves. Generate realistic images. Theoretical foundations of ray tracing. Theory of fractal geometry. Grammatically based models. Animation and principles of its construction.
Teaching and assessment:
Lectures include the main definitions from the computer graphic systems. During the practical lessons, students get the opportunity to put their theoretical knowledge into practice. For each practical lesson there are prepared methodological instructions and specific tasks to be performed. Over the course of the semester, students work towards the creation of a complete graphics project, following a certain sequence and including given components, with each practical lesson adding or improving individual modules of the implementation. The final grade is a weighted average between assessment of work during exercises and exam.

S03103 Diploma Thesis / S01864 State Exam

ECTS credits: 10
Weekly classes: 0lec+0sem+0labs+0ws
Assessment: defense / exam
Type of exam: oral / written+oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Lecturers from the Department of Computer Systems and Technologies
Abstract:
The diploma thesis e independent creative assignment, which is implemented under the guidance of a supervisor, and if necessary - a research consultant. Its aim is to students to demonstrate the knowledge and skills during training to achieve the goals and objectives of the thesis and defend their thesis before an State Examination Commission.
The state exam is taken before the State Examination Commission on approved syllabus that includes questions from all major disciplines. It consists of two parts - written and oral. To the oral examination shall be admitted students who have received evaluation of the written part at least Average(3).
Course content:
The diploma thesis includes: a note which includes all the basic literature, ideas, existing solutions, analyses, calculations, explanations, conclusions; graphical part which includes schematic diagrams; application with source code and / or developed by the student model or device, if it's part of the job; presentation of the thesis.
Teaching and assessment:
The Department of Computer Systems and Technologies is responsible for collecting, confirming and announcing proposals for topics of theses; distribution of students by themes and supervisors; the diploma practice; leadership, review and defense of theses.
A weekly consultation with the supervisor on which the performance of the tasks is observed is provided for students.
The student defends his/her diploma thesis or takes state exam in front of the State Examination Commission.

UNDERGRADUATE STUDIES IN INTERNET AND MOBILE COMMUNICATIONS

PROFESSIONAL STANDARDS OF A BACHELOR IN

INTERNET AND MOBILE COMMUNICATIONS

Degree course: **Internet and Mobile Communications**
Degree awarded: **Bachelor of Engineering (BEng)**
Professional Qualification: **Telecommunications Engineer**
Duration: **4 years (8 terms)**

The Bachelor of Engineering in Internet and Mobile Communications (IMC) should possess fundamental and specialist knowledge in a wide range of topics in the field of information and telecommunication systems. Students should adopt the idea of lifelong learning under the conditions of dynamically developing trends in the field of telecommunications. The knowledge and skills acquired throughout the degree course aim to help engineering graduates to adapt quickly to the conditions of the market.

The graduates in telecommunications should be able to perform activities in the field of assembly, exploitation and service of telecommunication devices, systems and technologies. The complex knowledge gained during the course of study provides students with the ability to perform organizational and managerial activities in fields connected with telecommunications.

The Bachelor of Engineering in Internet and Mobile Communications should possess the following theoretical knowledge and practical skills:

1. Key theoretical knowledge:

A *Bachelor* of IMC should:

- acquire knowledge required in the fundamental engineering courses – mathematics, physics, programming, etc.;
- have in-depth knowledge of the specialized courses, forming the basis for up-grading the degree course, such as Electrical Engineering, Semiconductors, Analogue and Digital Engineering, Power Supply, Antenna-fader and Microwave Systems, Radio Engineering, etc.;
- have expertise required in the basic specialized courses which include Measurements in Telecommunications, Radio Technical Systems, Television Systems, Switching, Multiplexing and Cable Equipment and Technologies, Cable and Optical Transfer Media and Systems, Signals and Systems, Processing and Transfer of Signals, Communication Networks and Systems, Computer Systems, Programming Languages, Operating Systems, Network Protocols, etc.;
- have good command of the basic principles, structure, and functional features of telecommunication devices, systems and technologies;
- have sufficient knowledge of foreign languages /fluent English and operative second foreign language/.

2. Key practical skills:

A *Bachelor* of IMC should:

- be familiar with computer and office equipment, application software, the Internet and Internet technologies;
- be able to use control-measuring devices, test and diagnostic tools; measure and analyze the results;
- be able to solve engineering problems related to the assembly, adjustment, exploitation, diagnostics and service of telecommunication devices, networks and systems self-dependently;
- have skills and aptitude for using foreign language information, including periodicals, technical books, and Internet information;
- be able to search, find, analyse and present information for solving particular problems;
- be able to work in a team with representatives of the same and different professions;

The wide range of training of the Bachelor of Engineering in Internet and Mobile Communications gives him/her the ability to adapt quickly and find employment in other engineering fields such as electronics, information systems and technologies, automation, etc.

The Bachelors of Engineering in Internet and Mobile Communications must have clear understanding of their role and significance in the development of the global information society and the responsibilities associated with that.

CURRICULUM
of the degree course in
INTERNET AND MOBILE COMMUNICATIONS

First year

Code	*First term*	*ECTS*	*Code*	*Second term*	*ECTS*
S00413	Introduction to Communications and Computer Technologies	3	S02793	Mathematics 2	5
S01604	Mathematics 1	6	SB15451	Object-Oriented Programming	6
SB15447	Programming	9	SB17729	Theory of Electrical Engineering	7
S02069	Physics	5	SB17730	Electrical Measurements	4
SB15448	3D Technologies	5	SB15454	Semiconductors	6
SB15450	English Language 1	2	SB15455	English Language 2	2
	Total for the term:	***30***		***Total for the term:***	***30***
S00072	Sports	1	S00072	Sports	1

Second year

Code	*Third term*	*ECTS*	*Code*	*Fourth term*	*ECTS*
S03065	Mathematics 3	5	SB17701	Analogue Devices	3
S02894	Radiowaves, Antenna-Fader and Microwave Systems	6	S03072	Data Transfer and Computer Communications	5
SB17671	Signals and Systems	6	S03109	Pulse and Digital Circuits	5
S03110	Digital Signal Procesing	6	S03070	Computer Organization	6
S03120	Programming Languages	5	S03114	Communication Circuits	4
SB15456	Technical English	2	S01455	WEB Design	5
			S03111	Course Projects on Pulse and Digital Circuits	2
	Total for the term:	***30***		***Total for the term:***	***30***
S00072	Sports	1	S00072	Sports	1
			S01840	Practical Training – 3 w.	3

Third Year

Code	*Fifth term*	*ECTS*	*Code*	*Sixth term*	*ECTS*
S03119	Microprocessor Systems	6	S03116	Teletraffic Engineering	6
SB15468	Communication Networks and Systems	5	SB17731	Automatic Control Systems	6
SB15469	Global Navigation Satellite Systems	4	SB16291	Economics	4
S03115	Multiplex Systems	5	S03104	Power Supply	6
SB13695	Radio Communication Technologies	5	S03122	Routing and Comutation	6
S03123	Optoelectronics and Optical Communications Course	3	S03124	Course project onTeletraffic Engineering	2
SB13696	Project on Radio Communication Technologies	2			
	Total for the term:	**30**		**Total for the term:**	**30**
			S03125	Practical Training – 4 w.	4

Fourth Year

Code	*Seventh term*	*ECTS*	*Code*	*Eighth term*	*ECTS*
SB13697	Network Administration and Management	5	SB10677	Mobile Cell Radio Networks	4
S03127	Telecommunication Security	4			
SB13698	Programming of Mobile Devices	4			
S01530	Multimedia Systems and Technologies	4			
SB10672	Television Systems	6			
	Elective ***(students select a* course*)***				
S03130	Wireless Technologies for Data Transfer	5			
SB10673	Image Processing and Computer Vision	5			
	Elective groups of courses ***(students select a group)*** **Group A**			**Elective groups of courses** ***(students select a group)*** **Group A**	
S03132	Course project on Communication Networks and Systems	2	S03136	Digital Signal Processors	3
	Total for the term for A group:	***30***	SB10678	Operating Systems and Network Protocols	3
			SB10679	Convergent Networks	3
			SB10680	Databases	3
	Group B			**Group B**	
S03133	Course project on Television Systems	2	SB13699	Video-Communication Technologies	3
	Total for the term for B group:	***30***	S02003	Digital Television Systems	3
			SB10681	Radar Systems	3
			SB10682	Coding in Telecommunication Systems	3
				Graduation	
			S03135	Self-dependent training	4
			S03144	Diploma work	10
			S00040	State exam	10
	Total for the term:	***30***		***Total for the term:***	***30***

Total for the degree course: 240 ECTS credits

S00413 Introduction to Communications and Computer Technologies

ECTS credits: 3 **Weekly workload:** 1l+0s+0lab+1pr
Assessment: Continuous assessment **Type of exam:** written and oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Assoc. Prof. Svetlana Petrova Stefanova, PhD, MEng, Dept. of CST, tel.: (+359 82) 888 356;
E-mail: sstefanova@uni-ruse.bg
Principal Assistant Lachezar Lazarov Yordanov, PhD, MEng, Dept. of CST, tel.: (+359 82) 888 859;
E-mail: LIordanov@ecs.uni-ruse.bg
Abstract:
The course aims to introduce the first year students to the current state and trends in the ICT fields, as well as to give basic knowledge and skills for using a PC, working with DOS and Windows applications, the Internet, etc. The students will need these basic skills in their further education.
Course content:
Structure of a personal computer, motherboard; functions and characteristics of the main modules, computer periphery; basic elements of computer and communications equipment, connections and markings; Microsoft Windows operating system; Microsoft Office (Word, Excel, Power Point); telecommunications equipment and technologies; Internet and Internet technologies; browsers.
Teaching and assessment:
The lectures are delivered 2 hours per week every week for the first eight weeks. The practical sessions are conducted in specialized labs at the Department of Computer Systems and Technologies and the Department of Telecommunications. The final mark is based on a mid-term test and a presentation on a specified topic. The test includes theoretical questions and practical tasks.

S01604 Mathematics 1

ECTS credits: 6 **Weekly workload**: 2l+2s+0lab+0pr+0,5rep
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Mathematics.
Faculty of Natural Sciences and Education.
Lecturers:
Assoc. Prof. Yuriy Dimitrov Kandilarov, PhD, Department of Mathematics, tel.: (+359 82) 888 634,
E-mail: ukandilarov@uni-ruse.bg
Principal Assistant Tihomir Bogomilov Gulov, PhD, Department of Mathematics, tel.: (+359 82) 888 489,
E-mail: tgulov@uni-ruse.bg
Abstract:
Mathematics 1 is fundamental to engineering education and builds on the studies of Mathematics from secondary education. It is imperative to the students' education in other mathematical subjects as well as in Physics, Mechanics, Electrical engineering and a number of general engineering subjects. The course includes topics from Linear algebra and analytical geometry, Differential and integral calculus of function of a variable.
Course content:
Linear algebra – matrices, determinants, system of linear equations; Vector algebra – vector operations; Plane analytical geometry – line in plane; Differential calculus of function of a variable - derivative of function and applications; Integral calculus – basic integration techniques, integration of rational functions.
Teaching and assessment:
The students get acquainted via lectures with basic mathematical notions. By rule, the theorems do not include proofs but there are many examples and applications given. The seminars develop the students' technical ability for practical problem solving. Students are allowed to use formulas during classes, tests and exam. Students should prepare for the seminars by learning the course material and examples. The exam is considered passed only if the student has solved at least two problems. One of those problems should be chosen from the Linear algebra, Vector algebra and Analytical geometry sections. The other one should be chosen from the Differential and integral calculus of a function of a variable. The final mark is formed after a talk with the student.

SB15447 Programming

ECTS credits: 9
Weekly workload: 3l+0s+0lab+2pr+2,0ca
Assessment: Exam
Type of exam: written
Departments involved:
Department of Informatics and Information Technologies.
Faculty of Natural Sciences and Education.
Lecturers:
Prof. Tzvetomir Ivanov Vassilev, PhD, MEng, Dept. of Informatics and Information Technologies,
tel.: (+359 82) 888 475; Email: tvassilev@uni-ruse.bg
Abstract:
The course is an introduction to programming and aims at acquiring skills to develop algorithms and computer programs with intermediate difficulty. Significant attention is paid to developing algorithms, as the skill to create algorithms is very important in order to develop effective programs. The C++ programming language is studied, which is widely spread and used in later courses.
Course content:
Principle of program control, computer components, data representation. Developing programs. Algorithms. Boolean algebra. Introduction to C++ programming language. Operations, expression. Assignment statement. Data input and output. IF and switch statements. Repetition. Arrays, pointers. Functions. Strings. Structures. Files. Classes and objects.
Teaching and assessment:
The lectures clarify the theoretic aspect of the topics and have a sufficient number of examples. This enables the students to prepare in advance for the workshops and to work independently during the classes.
The workshops are held in computer labs. The students do practical work developing, testing and debugging C programs.
The exam is written. It comprises problems that require developing a program and a commenting on existing programs. The problems have several items with an increasing level of difficulty.

S02069 Physics

ECTS credits: 5
Weekly workload: 2l+0s+2lab+0pr
Assessment: Exam
Type of exam: written, test
Departments involved:
Department of MMEEG and Physics.
Faculty of Transport.
Lecturers:
Assoc. Prof. Petko Hristov Mashkov, PhD, MEng, Dept. of MMEEG and Physics, tel:(+359 82) 888 583,
E-mail: pmashkov@uni-ruse.bg
Principal Assistant Rostislav Yuriev Kandilarov, PhD, MEng, Dept. of MMEEG and Physics,
tel: (+359 82) 888 583, E-mail: rkandilarov@uni-ruse.bg
Abstract:
The course aim is to introduce students to the physical character of processes and phenomena in nature and the methods of their investigation, with the most general properties of the matter and material objects. The laboratory exercises aim at creating skills for experimental investigation of physical phenomena.
Course content:
Measuring physical quantities. Mechanics of material point. Work and energy. Laws of conservation in mechanics. Oscillations & waves. Acoustics. Molecular physics and thermodynamics. Electric field and electric current. Magnetic field and magnetic forces. Electromagnetic field. Wave, geometric & quantum optics. Elements of Semiconductor physics and of Atomic & Nuclear physics.
Teaching and assessment:
Lectures give the main theoretical material, supported by some experimental and multimedia demonstrations of physical phenomena and processes. At the laboratory sessions the students work experimentally and investigate particular physical phenomena. Student knowledge of the theoretical material is tested regularly. The exam is in a form of test. The end mark depends on the results of the test and of the laboratory sessions.

SB15448 3D Technologies

ECTS credits: 5 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Continuous assessment **Type of exam:** written
Methodology management:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Georgi Valentinov Hristov, PhD; MEng; Department of Telecommunications, tel.: (+359 82) 888 663, E-mail: ghristov@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, PhD, MEng; Department of Telecommunications, tel.: (+359 82) 888 353, E-mail: dkyuchukova@uni-ruse.bg
Abstract:
3D Technologies is to familiarize students with the modern methods for creating 3D models and their application in different areas. The 3D technologies are becoming widely spread in different areas – education, industry, entertainment, advertisement and others. This will give the students who pass the course and acquire the basic knowledge the ability to find professional realization in wider area.
Course content:
The expected results are for students to acquire the necessary knowledge and skills to work with modern technologies for 3D scanning, modelling, animation, 3D printing and building application with augmented and virtual reality. Students will acquire advanced and in-depth theoretical and practical knowledge for creation of three-dimensional computer models – photogrammetry, triangulation, 3D scanning. They will get acquainted with the various technologies for 3D printing and will have the necessary knowledge to create various applications, computer games and animations. After completing the course, students will be able to apply the basic techniques for reconstruction and creation of three-dimensional computer models. They will acquire skills for digitalization of objects through photogrammetry and 3D scanning. They will learn how to create augmented and virtual reality applications and will be able to create photorealistic scenes by properly rendering the objects in the scenes. In addition, they will be able to perform prepress and be able to create real copies of objects by using 3D printers.
Teaching and assessment:
The course includes 2 weekly hours of lectures and 2 hours of workshops. The workshops are held in a computer lab equipped with 3D scanners, 3D printers, cameras, workstations with software for 3D reconstruction, modelling and rendering.

SB15450 English Language 1

ECTS credits: 2 **Weekly workload**: 0l+0s+0lab+2pr
Assessment: Continuous assessment **Type of exam**: written and oral
Departments involved:
Department of Foreign Languages, Faculty of Mechanical & Manufacturing Engineering
Lecturers:
Sr Lecturer Mariela Georgieva Risova, Dept. of Foreign Languages, tel.: (+359 82) 888 816;
E-mail: mrisova@uni-ruse.bg
Abstract:
The subject English Part 1 for the degree courses *Computer Systems and Technologies*, *Internet and Mobile Communications and Information and Communication Technologies* comprises 30 hours of classroom work and provides basic skills for oral and written communication in the foreign language in view of the students' field of study. New vocabulary connected with the basic terminology of the specialized subjects is acquired. General topics related to the field of informatics and computer science are considered. Skills to elicit essential information from a text and write a summary are developed. Students are expected to prepare and give a short presentation on a chosen topic related to computing or IT. A prerequisite for 'English Part 1' is an English course taken in secondary school.
Course content:
Education, professions and professional realisation; Computer sciences. Inventions and discoveries; Living in a digital era. Computing and communication systems; Computer essentials. Inside a PC system. Smartphones, laptops, tablets. Steve Jobs presenting the I-Pad. Input devices. Interacting with your computer. Display screens and ergonomics. Magnetic storage. Specifics of technical English grammar and vocabulary.
Teaching and assessment:
The practical exercises include the following components: introducing new information; summary and revision; presenting and analysing individually accomplished tasks; knowledge reinforcement through diverse exercises - role-plays, work on authentic texts and in a computer room. Students are given two written tests during the semester. The requirements for obtaining a semester validation signature are regular attendance, completing assigned tasks, giving a presentation and doing the tests. The final mark is based on continuous assessment.

S02793 Mathematics 2

ECTS credits: 5 **Weekly workload**: 2l+2s+0lab+0pr
Assessment: Exam **Type of exam**: written and oral
Departments involved:
Department of Mathematics.
Faculty of Natural Sciences and Education.
Lecturers:
Assoc. Prof. Ivanka Trifinova Angelova, PhD, Department of Mathematics, tel.: (+359 82) 888 587,
E-mail: iangelova@uni-ruse.bg
Principal Assistant Anna Simeonova Lecheva, PhD, Department of Mathematics, tel.: (+359 82) 888 453,
E-mail: alecheva@uni-ruse.bg
Abstract:
This subject is fundamental for mathematics education in engineering sciences. The goal is to get students acquainted with the basic notions of mathematical analysis, and give them practical computational abilities. Students can use the gained knowledge for further study of higher mathematics – part 3, physics, computer sciences.
Course content:
Definite and Line integrals, Partial derivatives, Differential Equations, Complex Functions, Laplace transform.
Teaching and assessment:
The educational process is realized by lectures and seminars. Lectures present the basic notions and methods for exploring the problems. There is a final written and oral exam at the end of the course.

SB15451 Object-oriented programming

ECTS credits: 6 **Weekly workload:** 2l+0s+0lab+2p+1,0ca
Assessment: Exam **Type of exam**: written and oral
Departments involved:
Department of Computer Systems and Technologies.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Assoc. Prof. Milko Todorov Marinov, PhD, MEng, Dept. of CST, tel: (+359 82) 888 356.
E-mail: mmarinov@ecs.uni-ruse.bg
Principal Assistant Tsvetelina Petrova Kaneva, PhD, MEng, Dept. of CST, tel: (+359 82) 888 681.
E-mail: tsmladenova@uni-ruse.bg
Abstract:
The course objective is for the students to familiarise themselves and to practically assimilate the methodology of object-oriented programming (OOP) as a basis of many modern languages and systems for developing computer applications. The stress is placed on the practical application of the approach by using universal library functions as well as when developing own functions.
Course content:
Introduction to OOP. Classes and objects – definitions. Constructors and destructors. Data members. Member functions. Overloaded functions. Inheritance. Multiple inheritance. Virtual classes. Virtual functions. Polymorphism. Template class library.
Teaching and assessment:
The lecture topics give the main theoretic aspects of the problems. The workshops and course work classes are conducted in a computer lab. The students have to independently solve, encode and test with the aid of a specific programming environment elements of given problems. Each student is assigned an individual task, which they have to complete by the end of the semester. The final mark is a weighted average of four marks: activity during workshops, implementation of the individual task, written report and final exam.

SB17729 Theory of Electrical Engineering

ECTS credits: 7 **Weekly workload**: 3l+0s+0lab+2pr+1,0ca
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Automatics and Electronics.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Boris Ivanov Evstatiev, DSC, MEng, Dept. of Automatics and Electronics, tel.: (+359 82) 888 371;
E-mail: bevstatiev@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, MEng, Dept. of Automatics and Electronics,
tel.: (+359 82) 888 772, E-mail: yneikov@uni-ruse.bg
Abstract:
The course Theory of electrical engineering introduces the basic concepts of electromagnetism and energy and information transfer to future engineers in computer and communication technologies. It is the basis for all subsequent courses in electrical engineering and electronics.
Course content:
Basic laws and theorems in electrical circuits. Analysis of DC circuits. Nonlinear resistors. Analysis of nonlinear DC circuits. Transient processes. Basic laws and theorems in sinusoidal circuits. Sinusoidal steady state analysis. Mutually coupled inductors. Two-port networks. Nonsinusoidal waveforms. Frequency response in electric circuits. Transmission lines. Nonlinear elements in AC circuits.
Teaching and assessment:
Lectures present the teaching material according to the syllabus. The continuous assessment includes laboratory exercise reports and a course project assignment. The final mark is formed as a sum of the reports, the course project and the final exam, which is performed in written form.

SB17730 Electrical Measurements

ECTS credits: 4 **Weekly workload**: 2l+0s+0lab+1pr
Form of assessment: Continuous assessment **Type of exam**: written test
Departments involved:
Department of Automatics and Electronics.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Assoc. Prof. Snezhinka Lyubomirova Zaharieva, PhD, Dept. of Automatics and Electronics,
tel.: +359 82 888 382, E-mail: szaharieva@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of Automatics and Electronics, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
The Electrical Measurements course has the aim to make the students familiar with the basic methods and devices for electrical and non-electrical quantities evaluating as well as the metrical appraisals and results calculating. Another aim is students to acquire skills and habits which might be needed in measurement schemes realizing and to solve particular problems as well as in students' activities as forth coming experts – electrical engineers.The knowledge and skills acquired on this module are needed for the students to perceive the particular modules during the tutorials for metrical design ensuring of the technologic and production processes.
Course content:
Quantitative analysis and quantitative methods; Identification of a measuring method; Identification of a calculating method; A quality of the quantitative appraisals; Electrical and magnetic quantities; Assigning values to the electrical and magnetic quantities; Electrical quantities measuring by immediate comparison; Electrical quantities by mediate comparison; Digital electro-measuring appliances; Appliances for registration and observation; Electrical quantities calculating; Quantitative analysis of non-electrical quantities by electrical methods and devices; System for ensuring the unity of the measurements.
Teaching and assessment:
The process of the education on "Electrical Measurements" module consists of lectures and tutorials. Video materials and laboratory testbeds might be used for demonstrations. Normally the tutorials are carried out into cycles. There are four places of work at the hall where on the average three students work together on each of it. The duration of each tutorial is two hours and at the end the students have to prepare a report. During the semester long marking is realized by testing at the time when the tutors are in progress and by periodical test control. The education completes with an exam at the end of the second semester.

SB15454 Semiconductors

ECTS credits: 6 **Weekly workload**: 2l+0s+2lab+0pr+0,5rep
Assessment: Exam **Type of exam**: written test
Department involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Dept. of Telecommunication, tel.: (+359 82) 888 839;
E-mail: tiliev@uni-ruse.bg
Principal Assistant Ventsislav Petkov Keseev, PhD, MEng; Dept. of Telecommunications,
tel.: (+359 82) 888 831; E-mail: vkeseev@uni-ruse.bg
Abstract:
The course objective is to familiarize the students with the main active semi-conducting elements used in all electronic and computing devices and tools for communication and automation. The physical principles are studied as well as the structure, characteristics, and parameters of discrete elements – diodes, transistors, tiristors, opto-electronic elements, etc. Specific applications of elements, ways of connection, and methods of operation mode computation are addressed. Brief information about the technology of manufacturing of discrete elements and integrated circuits is given.
Course content:
Electrical materials and physical fundamentals of semi-conductors: conductivity, non-equilibrium state, contact metal-semiconductor; p-n transition. Semiconductor diodes: volt-ampere characteristics of idealised and real diode; breakthroughs in diodes; operation in impulse mode. Operation principle of transistors, main connection circuits, modes of operation and static volt-ampere characteristics; parameters of transistor as a quadruple; frequency properties of transistors; dynamic mode of operation; transistor operation in switch mode. Field transistors: with control p-n transition; MOS- transistors. Tiristors. Optoelectronic elements. Fundamentals of microelectronics: types of integrated circuits; main principles of construction of bi-polar and MOS - integrated circuits.
Teaching and assessment:
The lectures are two hours per week. Each lecture is presented using audio-visual materials. The laboratory exercises are two hours per week. Before the exercise the preparation of students on the theoretical material and the methods for testing is checked. For each exercise students prepare a protocol, which is checked by the lecturer. The results of the assessment during the exercises are taken into account when forming the final mark at the exam. Examination test contents 20 questions.

SB15455 English Language 2

ECTS credits: 2 **Weekly workload**: 0l+0s+0lab+2pr
Form of assessment: Continuous assessment **Type of exam**: written and oral
Departments involved:
Department of Foreign Languages.
Faculty of Mechanical & Manufacturing Engineering**.**
Lecturers:
Sr Lecturer Mariela Georgieva Risova, Dept. of Foreign Languages, tel.: (+359 82) 888 816;
E-mail: mrisova@uni-ruse.bg
Abstract:
The subject English Part 2 for the degree courses *Computer Systems and Technologies*, *Internet and Mobile Communications and Information and Communication Technologies* comprises 30 hours of classroom work and it extends the foreign language competence of the students to cope with specialised literature and professional communication. Work is done to achieve a greater accuracy in the use of typical and common phrases, structures and grammatical models. Authentic texts are widely used to bring the learners closer to the scientific style. Collocations with frequently used terms and notions are considered. Students prepare and give team presentations.
Course content:
Computer Networks; Cybercrimes; Computers in education; Word processing; Multimedia; Characteristics of the technical text; Job interview; New technologies and Trends in development; History of BBC.
Teaching and assessment:
The practical exercises include the following components: introducing new information; summary and revision; presenting and analysing individually accomplished tasks; knowledge reinforcement through diverse exercises - role-plays, work on authentic texts and in a computer room. Students do two written tests during the semester.
The requirements for obtaining a semester validation signature are regular attendance, completing assigned tasks, participating in a team presentation and doing the tests. The final mark is based on continuous assessment.

S03065 Mathematics 3

ECTS credits: 5
Weekly workload: 2l+0s+0lab+1pr+0,5rep
Assessment: Exam
Type of exam: written
Departments involved:
Department of Applied Mathematics and Statistics.
Faculty of Natural Sciences and Education.
Lecturers:
Assoc. Prof. Iliana Petrova Raeva, MSc, PhD, Dept of Numerical Methods and Statistics,
tel.: (+359 82) 888 466, E-mail: rk-pms@uni-ruse.bg
Abstract:
The purpose of the course on 3065 Mathematics 3 is to rise students' competence in the sphere of processing and analysis of data from empirical statistical researches, as well as in the sphere of harmonic analysis (electrical fluctuations and signals) for the specific needs of engineering practice.
Course content:
Fourier series, elements of Theory of Probability, Mathematical Statistics, Experiment Planning, Regression and Correlation Analysis.
Teaching and assessment:
The material is presented in lecture classes - the theory is illustrated with many example problems. The practical classes take place in computer labs. They are lead by the teacher as an organized problem solving on a material from the lecture topics. The practical classes include also gaining experience with the software products MATLAB and SPSS. Two control works are taken during the semester - they give the student the opportunity to get their final mark on the course without going on an exam- with minimum marks "Good (4)" on each one of the control works. The course ends up with a written exam and a colloquy with the student if needed.

S02894 Radiowaves, Antenna - Feeder and Microwave Engineering

ECTS credits: 6
Weekly workload: 2l+0s+0lab+2pr
Assessment: Exam
Type of exam: written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Dept. of Telecommunication, tel.: (+359 82) 888 839;
E-mail: tiliev@uni-ruse.bg
Abstract:
Students acquire theoretical knowledge and practical skills regarding electromagnetic field bases, principles of generation and propagation of electromagnetic waves, specific element basis, constructive structure and organization of super-high-frequency (SHF) communication systems.
Course content:
Electromagnetic wave. Electromagnetic wave propagation in different material environments. Antenna devices. Coaxial lines. Feeder lines. Micro-wave devices. Passive SHF elements. Valve SHF devices. Semiconductor SHF devices. SHF communication systems. Safety techniques on working with microwave devices.
Teaching and assessment:
Lectures are presented 2 hours per week for the students in the **2**nd course in the specialty of Telecommunications . Practical exercises are implemented frontally 2 hours per week. Students have to be theoretically prepared for them and to make a report for each exercise. The course continuous assessment is made during the laboratory exercises by assigning particular tasks and verifying their accomplishment, accepting the practical exercise reports. Students are consistently consulted about the lecture material. Student duties outside lecture and exercise halls include studying the lecture notes, preparing for the practical exercises and making the reports.

SB17671 Signals and Systems

ECTS credits: 6 **Weekly workload**: 2l+0s+0lab+2p+1,0ca
Assessment: Exam **Type of exam**: written and oral
Departments involved:
Department of Automatics and Electronics.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Assoc. Prof. Snezhinka Lyubomirova Zaharieva, PhD, Dept. of Automatics and Electronics,
tel.: +359 82 888 382, E-mail: szaharieva@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of Automatics and Electronics, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
The subject Signals and systems has the objective to acquaint the students with the main principles in the creating, processing and transmission of electrical signals, methods and means for analysis of basic parameters and characteristics of systems and processes for information conversion and transmission.
Course content:
General report about the information theory. Electrical signals - types, main characteristics. Spectral analysis of periodic and aperiodic signals. Correlation analysis. Discreteness. Linear conversions of signals. Input and output emittance of a two-port. Time and frequency responses of two-ports. Analog and digital filtration. Modulation and demodulation. Coding. Signal conversions. Course assignment - harmonic analysis of periodic and aperiodic signals. Application of the theorem of Naikuist - Kotelnikov.
Teaching and assessment:
The lectures and exercises have two hours duration every week. The practical exercises are done frontally. Manual calculations, computer simulations and measurements are done during the laboratory exercises. The students prepare a report for each laboratory exercise. The students on their own do the course assignment. It helps for the consolidation of knowledge for harmonic analysis of periodic and aperiodic signals and the application of the Naikuist - Kotelnikov theorem.

S03110 Digital Signal Processing

ECTS credits: 6 **Weekly workload**: 2l+0s+0lab+2pr+1,0ca
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Adriana Naydenova Borodzhieva, MEng, PhD; Dept. of Telecommunications,
tel.: (+359 82) 888 734, E-mail: aborodzhieva@uni-ruse.bg
Principal Assistant Ivanka Dimitrova Tsvetkova, MEng, PhD; Dept. of Telecommunications,
tel.: (+359 82) 888 836, E-mail: itsvetkova@uni-ruse.bg
Abstract:
The course aims to teach the basic principles of digital signal processing, namely: basic parameters of the signals and specters, processing of digital signals, detection of digital signals, linear systems analysis and application of discrete Fourier transform, the foundations of the theory of statistical decision-making, methods for construction of the DAC and ADC, general theory and numerical methods for coding the signal.
Course content:
General information about the digital signals. Basic operations in the analog-digital conversion of signals. Z-transformation of the digital signals. Discrete Fourier Transformation. Sinus and cosine transformations. Application of DFT. Fundamentals of the theory of statistical decision-making. Digital filtration. Digital filtering in the time domain. Two-dimensional and n-dimensional filtration. Methods for construction of the DAC and ADC. Discrete random processes. General coding theory. Digital methods for coding.
Teaching and assessment:
The topics of the lectures give the students the possibility to get acquainted theoretically with the main issues of the digital signal processing before doing the practical exercises. The practical exercises are conducted in subgroups. For the topic of the exercise, students are informed in advance and request them prior theoretical preparation.

S03120 Programming Languages

ECTS credits: 5
Weekly workload: 2l+0s+0lab+2pr
Assessment: Continuous assessment
Type of exam: written and oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Georgi Todorov Georgiev, PhD, MEng, Dept. of CST, tel.: (+359 82) 888 744;
E-mail: gtgeorgiev@ecs.uni-ruse.bg
Abstract:
The aims of this course are to generalize the students' knowledge on programming languages; to give them a more in-depth view of fundamental underlying principles and ultimately to facilitate the process of switching to a new programming language. The course content comprises two parts. In the first one, a new for the students programming language - Java - is introduced, including its use for developing mobile applications. The second part deals with how standard components of high level PLs, such as variables and data types, expressions and operators, subroutines and parameters, are implemented at the machine level.
Prerequisites for this course are the courses in Programming1, Programming 2 and Object-oriented Programming. This course could be a prerequisite for the Diploma Project.
Course content:
Programming languages timeline, definitions, taxonomy. Introduction to the Java programming language. OOP in Java. Structured error-handling. GUI and event handling in Java. Input-output in Java. Threads in Java. Data storage containers in Java. Java for mobile applications - Java ME and Android. Low level (machine or Assembler) implementation of variables and data types, expressions and operators, subroutines and parameters. Introduction to Pythin. Functional programming with haskell.
Teaching and assessment:
The course includes 2 weekly hours of lectures and 2 hours of workshops. The workshops are held in a computer lab with powerful PCs. Two tests are held during the semester. The final mark is based on marks from the two tests, and the work during workshops throughout the semester.

SB15456 Technical English

ECTS credits: 2
Weekly workload: 0l+0s+0lab+2pr
Assessment: Continuous assessment
Type of exam: written and oral
Departments involved:
Department of Foreign Languages.
Faculty of Mechanical & Manufacturing Engineering.
Lecturers:
Sr Lecturer Mariela Georgieva Risova, Dept. of Foreign Languages, tel.: (+359 82) 888 816;
E-mail: mrisova@uni-ruse.bg
Abstract:
The subject 'Technical English' for the degree courses *Computer Systems and Technologies*, *Internet and Mobile Communications and Information and Communication Technologies* comprises 30 hours and it extends the foreign language competence of the students with respect to specialised literature and professional communication. Work is done to achieve a greater accuracy in the use of typical and common phrases, structures and grammatical models. Authentic texts are widely used to bring the learners closer to scientific style. Collocations of more frequently used terms and notions are considered. Students prepare and give individual or team presentations related to well-established IT companies or distinguished specialists in the particular professional fields.
Course content:
Distance and e-learning; Electronic publishing; Optical fibers; Web design; Blog descriptions; Computer languages; Jobs in ICT; Video games and videoconferences; Speech technologies, New technologies; Future trends in the development of the computers and telecommunications.
Teaching and assessment:
The practical exercises contain the following components: introducing new information; summary and revision; presenting and analysing individually accomplished tasks; knowledge reinforcement through diverse exercises - role-plays, work on authentic texts and in a computer room. Students are given two written tests during the semester.
The requirements for obtaining a semester validation signature are regular attendance, completing assigned tasks, giving an individual or team presentation and doing the tests. The final mark is based on continuous assessment.

SB17701 Analog Devices

ECTS credits: 3 **Weekly workload**: 2l+0s+0lab+1pr
Assessment: Continuous assessment **Type of exam**: written
Departments involved:
Department of Automatics and Electronics.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Anelia Vladimirova Manukova, DSC, MEng, Dept. of Automatics and Electronics, tel.: (+359 82) 888 404; E-mail: amanukova@uni-ruse.bg
Assoc. Prof. Snezhinka Lyubomirova Zaharieva, PhD, MEng, Dept. of Automatics and Electronics, tel.: (+359 82) 888 382; E-mail: szaharieva@uni-ruse.bg
Abstract:
The compulsory subject gives the students the necessary minimum of knowledges in analog devices. It discusses the factors and methods for the realization of the most often used low-level and power amplifiers and generator stages in a discrete and integral input, methods for dc and ac analysis of the discussed circuits, as well as instructions for their design are used.
Course content
General information about the amplifying engineering; main characteristics and operation modes. Back-coupling in the amplifiers; influence of the negative back-coupling on the main values of the amplifiers. Resistance of the amplifiers. Aperiodic amplifiers of small signals with a common emitter, common base and common collector by middle, low and high frequencies. Cascade circuits. Aperiodic amplifiers of power. Main elements from the analog devices of the analog integrated circuits. Differential amplifiers. Direct current amplifiers. Operational amplifiers - general characteristics and main circuits. The subject contains a course assignment.
Teaching and assessment:
Exercises carried out in two stages: analysis, design and measurement of the discussed device and/or computer analysis.
Course assignment is involved. The continuous assessment during the exercises is done by oral discussions, checking of the home works. Method of continuous assessment – written and oral test.

S03072 Data transmission and Computer Communications

ECTS credits: 5 **Weekly workload**: 2l+0s+0lab+2pr
Assessment: Exam **Type of exam**: written test
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lectors:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Dept. of Telecommunication, tel.: (+359 82) 888 839; E-mail: tiliev@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, PhD, MEng; Department of Telecommunications, tel.: (+359 82) 888 353, E-mail: dkyuchukova@uni-ruse.bg
Principal Assistant Georgi Dimitrov Georgiev, MEng; Dept. of Telecommunications; tel.: (+359 82) 888 353; E-mail: gdgeorgiev@uni-ruse.bg
Abstract:
This course focuses on the transport of multi-media information among distributed computer systems. We examine how modern communication protocols, as implemented in the Internet, satisfy the differing requirements of the services that generate and use multi-media information.
Course content:
The course contains: OSI history, TCP/IP architecture, Digital Communication, Multiplexing, Successfully Allocating Resources, and Encoding Application Data, Securing the Data.
Teaching and assessment:
The lectures clarify the theoretic aspect of the topics and have a sufficient number of examples. This enables the students to prepare in advance for the workshops and to work independently during the classes.
The workshops are held in computer labs. The students do practical work developing, testing and debugging computer networks.

S03109 Pulse and Digital Devices

ECTS credits: 5 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Exam **Type of exam**: written test
Departments involved:
Dept. of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, PhD, MEng; Dept. of Telecommunications; tel.: (+359 82) 888 823;
E-mail: nina@uni-ruse.bg
Assoc. Prof. Adriana Naydenova Borodzhieva, PhD, MEng; Dept. of Telecommunications;
tel.: (+359 82) 888 734; E-mail: aborodzhieva@uni-ruse.bg
Principal Lecturer Ivanka Dimitrova Tsvetkova, PhD, MEng; Dept. of Telecommunications,
tel.: (+359 82) 888 836, E -mail: itsvetkova@uni-ruse.bg
Abstract:
The subject has the objective to familiarize students with the main problems of digital electronics. It links the functions of the digital elements with their microelectronic basis on one hand, and on the other hand – with their application when building pulse and digital devices. Deep knowledge in electrical engineering and semiconductors is necessary. The subject helps to give knowledge in the field of hardware.
Course content:
Boolean algebra. Synthesis and analysis of combinational circuits. Digital circuits with memory. Forming circuits. TTL integrated circuits. CMOS logic integrated circuits. Triggers. Schmidt triggers. Multi-vibrators. Impulse circuits with operating amplifiers. Particularities of integrated circuits with middle scale of integration. Interface circuits.
Teaching and assessment:
The lectures give the students the opportunity to get acquainted theoretically with the main questions of digital electronics before the practical exercises. The students must be prepared for each exercise and at the end prepare a report for each of them. The exam is conducted in form of a written test.

S03070 Computer Organization

ECTS credits: 6 **Weekly workload**: 2l+0s+0lab+2pr+1,0ca
Assessment: Exam **Type of exam**: written and oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Aneliya Stoyanova Ivanova, PhD, MEng, Department of CST, tel.: (+359 82) 888 827;
E-mail: AIvanova@ecs.uni-ruse.bg
Abstract:
The objective of the Computer organization course is to familiarize the students with the arithmetic and algorithmic fundamentals of computer circuitry and most of all - with the structure and way of operation of the CPU. The following topics are considered in details: basic building blocks of the processor, structure and way of operation of Arithmetic and Logic Unit, Control Unit, registers, stack, cache, RAM, interrupt system. The organization of computational process is considered, too. Digital signal processors are discussed, as well as the fundamental computer peripherals.
Course content:
Arithmetic basis – counting systems, arithmetic computations, presentation and coding of numerical, symbolic and logical data. CPU - definition, classification, basic building blocks. Structure of the arithmetic and logic unit. Structure of the control unit. Memory structure – registers, stack, cache, RAM. Structure of the interrupt system. Organization of the computational process. Digital signal processors. Computer peripherals.
Teaching and assessment:
At the lectures the students are familiarized in a theoretic aspect with the methods and algorithms for execution of various operations in computer. At the seminars the structure and way of operation of different CPU units and operational blocks are discussed. At the workshops, the students explore the discussed algorithms using interactive software simulators of the basic CPU units and operational blocks. The students take the role of the control unit and set the necessary control signals by clicking the corresponding buttons. During the lectures and workshops the learning content is delivered using modern presentation systems with interactive whiteboards.The course assignment is developed in the virtual laboratory on Computer Organization.

S03114 Communication Circuits

ECTS credits: 4 **Weekly workload**: 2l+0s+0lab+1pr+1,0ca
Assessment: Exam **Type of exam**: written and oral
Methodology management:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Adriana Naydenova Borodzhieva, MEng, PhD; Dept. of Telecommunications,
tel.: (+359 82) 888 734, E-mail: aborodzhieva@uni-ruse.bg
Assoc. Prof. Nina Vasileva Bencheva, MEng, PhD; Dept. of Telecommunications, tel.: (+359 82) 888 823,
E-mail: nina@uni-ruse.bg
Abstract
The course “Communication Circuits” familiarizes the students with the most frequently used communication circuits and systems and the main methods for their analysis and synthesis: resonant circuits and electrical filters. Different types of modulation are considered. The acquired knowledge is a basis for all specialized courses.
Syllabus contents:
Resonant circuits. Series-resonant circuits and parallel-resonant circuits. Coupled circuits. Electrical filters – low-pass, high-pass, band-pass and band-stop. Reactive filters – LC filters of type “K” and type “m” – series-derivative and parallel-derivative. Passive and active RC filters. Approximation of amplitude responses. Modulations. Amplitude modulation. Angular modulation – frequency modulation and phase modulation. Pulse modulations – pulse-amplitude modulation, pulse-time modulation, pulse-coded modulation.
Technology of teaching:
Lectures present the material taught according to the syllabus. At the practical exercises, students solve problems covering the topics of the syllabus. Exercises with computer simulation and laboratory models are provided. The continuous assessment of lectures and practical classes is carried out by written tests. At the beginning of the semester, each student is given an individual problem as a course assignment. It should be presented at the end of the semester in a written form and defended orally. The final assessment is accomplished with testing in a written and oral form.

S01455 Web Design

ECTS credits: 5 **Weekly workload:** 2l+0s+0lab+2pr+1,0ca
Assessment: Continuous assessment **Type of exam**: written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Georgi Todorov Georgiev, PhD, MEng, Dept. of CST, tel.: (+359 82) 888 744;
E-mail: gtgeorgiev@ecs.uni-ruse.bg
Assoc. Prof. Jordan Ivanov Kalmukov, PhD, MEng, Dept. of CST, tel.: (+359 82) 888 681;
E-mail: jkalmukov@ecs.uni-ruse.bg
Abstract:
The course objective is to familiarize the students with the underlying client-side technologies for creating a Web site, to create awareness of W3C standards, to promote good practices for achieving Web content accessibility, usability and credibility. A side objective of the course is to give the students hands-on experience with a Web content creation integrated development environment.
Course content:
A short history of Internet. Basic services and WWW. Introduction to HTTP. HTML. The need for stricter standards - from HTML to XHTML to HTML5. Separating the document structure from the presentation - CSS. Client-side programming - the ECMAScript / JavaScript language. The Document Object Model (DOM). New features in HTML5. Fundamental design goals of a Web site - accessibility, usability and credibility. Introduction to Search engine optimization (SEO).
Teaching and assessment:
Lectures are given as multimedia presentations. The workshops are problem-oriented; the students have specific tasks to solve in each workshop, using a simple text editor or Web content creation IDE. In the course of the semester, the students gradually build a complete site, enhancing it in each workshop session. Each student is assigned an individual task, which they have to complete by the end of the semester. The final mark is a weighted average of three marks: activity during workshops, a mid-term test and a final test.

S03111 Course Project on Pulse and Digital Devices

ECTS credits: 2 **Weekly workload**: 0l+0s+0lab+0pr+3,0cp
Assessment: defence **Type of exam**: written and oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, PhD, MEng; Dept. of Telecommunications; tel.: (+359 82) 888 823; E-mail: nina@uni-ruse.bg
Assoc. Prof. Adriana Naydenova Borodzhieva, PhD, MEng; Dept. of Telecommunications; tel.: (+359 82) 888 734; E-mail: aborodzhieva@uni-ruse.bg
Principal Lecturer Ivanka Dimitrova Tsvetkova, PhD, MEng; Dept. of Telecommunications, tel.: (+359 82) 888 836, E -mail: itsvetkova@uni-ruse.bg
Abstract:
The Pulse and Digital Devices course project objective is to consolidate the students' knowledge about basic problems in digital electronics. The main idea is to connect the functions of the digital elements with their microelectronic basis and with their application when building pulse and digital devices. The acquired knowledge is used in the special subjects in the field of digital engineering.
Course content:
The course project consists of two parts. A definite digital device without memory is designed with assigned element base set in the first part. The calculated logical functions are minimized and a structural device scheme is made. With assigned external characteristics and parameters of a pulse device, the digital elements are chosen, the parameters and logic functions are analyzed and some pulse and digital circuits are designed in the second part.
Teaching and assessment:
The course project is made by the students independently. Individual assignments are given for the first part at the beginning of the semester and after being accomplished (by the 7th week) individual assignments are given for the second part. During the semester students can visit weekly tutorials. The defence of each part of the course project is done orally and the suggested scheme solutions given in the explanatory summary are substantiated.

S01840 Practical Training 1

ECTS credits: 3 **Weekly workload**: 3 weeks, 90 hours
Assessment: Colloquium **Type of exam**: written report
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Department of Telecommunications, tel. (+359 82) 888 839, E-mail: tiliev@uni-ruse.bg
Abstract:
The aim of the course Practical Training 1 is to assimilate the acquired theoretical knowledge and practical skills by the students from the BSc programme in Internet and mobile communications, and to obtain new specific knowledge and skills in the conditions of real working firms and organizations engaged in design, introducing, exploitation and maintenance of communication-information systems, etc.
Course content:
Introduction to the structures, character and the assignments of the different subdivision in a specific organization. Studying the widespread communication-information systems, their constructive and technological parameters and characteristics, functional potentialities and exploitation special features. Direct participation depending on trainee-official position in the exploitation and maintenance of the communication equipment.
Teaching and assessment:
The practices are organized in the period fixed according to schedule of the educational process. The practice is realized in enterprises, firms, organizations with modern well-appointed manufacture or in organizations where contracts for practical training are concluded. The practice can be carried out in en enterprise offered by the student but on condition that the enterprise is with necessary equipment allowing the realization of practice aims and tasks (with tutor's permission).

S03119 Microprocessor Devices

ECTS credits: 6 **Weekly workload:** 2l+0s+0lab+2pr+2,0ca
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, PhD, MEng; Dept. of Telecommunications; tel.: (+359 82) 888 823;
E-mail: nina@uni-ruse.bg
Abstract:
The subject “Microprocessor Devices” has the objective to acquaint the students with the characteristics, organization, functioning and usage of the microprocessors and microcomputers systems. The subject is based on the PIC18FXX2 single chip microcontroller and the MPLAB development environment. Methods and circuits of digital-analog and analog-digital conversion are discussed.
Course content:
Microprocessor’s architecture. Microprocessor system’s architecture. Memory organization. Fundamentals and organization of the parallel interface, series interface and timers modules. ADC and DAC convertors.
Teaching and assessment:
The topics of the lectures give the possibility to the students to get acquainted theoretically with the main issues of the microprocessor devices before doing the practical exercises. Students develop and debug programs for exploring the components of the microprocessor system or the modules of the microcontroller using the available development environment.

SB15468 Communication Networks and Systems

ECTS credits: 5 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Georgi Valentinov Hristov, PhD, MEng; Department of Telecommunications, tel.: (+359 82) 888 663,
E-mail: ghristov@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, PhD, MEng; Department of Telecommunications,
tel.: (+359 82) 888 353, E-mail: dkyuchukova@uni-ruse.bg
Principal Assistant Georgi Dimitrov Georgiev, MEng; Dept. of Telecommunications; tel.: (+359 82) 888 353;
E-mail: gdgeorgiev@uni-ruse.bg
Abstract:
The course objective is to provide the students with working knowledge of the basic tasks, principles and methods used in telecommunication networks, as well as their main areas of application. The lectures include architecture, functionality, interfaces and protocols, which are main part of the modern telecommunication networks. Some of the lectures include information about the newest technologies used for data transmission.
In addition a number of practical problems are discussed during the lectures. The lectures let the students know about different kind of method and techniques, which solute the above problems.
Course content:
Network Protocols and communications. Hierarchical Network design. Router Architecture. IPv4 addressing and structure of IPv4 addresses. IPv6 protocol – overview, motivation and basic characteristics. Fixed Length Subnet Masking and Variable Length Subnet Masking. IPv4 – IPv6 integration mechanisms. Switching process – basic switch configuration. Virtual Local Area Networks. Static and Dynamic Routing in communication networks. Network security – access control lists. Network Address Translation.
Teaching and assessment:
The topics of the lectures gives the possibility to the students to get acquainted theoretically with the main issues of the communication networks. Students have the availability to practice their knowledge during the planed exercises. The department of Telecommunications has equipped laboratories with CISCO devices. During the practice, students create simulated models of communication networks, which are then investigated.

SB15469 Global Navigation Satellite Systems

ECTS credits: 4 **Weekly workload**: 2l+0s+0lab+1pr+0,5rep
Assessment: Continuous assessment **Type of exam**: written
Department involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Department of Telecommunications,
tel. (+359 82) 888 839, E-mail: tiliev@uni-ruse.bg
Abstract:
Students acquire theoretical knowledge and practical skills regarding the basics of global navigation satellite systems, coordinate systems, principles for satellite location determination, positioning accuracy and precision, position calculation methods, positioning algorithms for GNSS systems and their application.
Course content:
Fundamentals of GNSS technology. Global navigation satellite systems. Segments in GNSS systems. Satellite signals. Path losses. Sources of errors. Positioning accuracy. GNSS positioning algorithms. Architecture of the GNSS receiver. Monitoring of Space Weather using the Global Navigation. Application of GNSS systems.
Teaching and assessment:
Lectures are presented 2 hours per week for the students in the **3**rd course in the specialty of Internet and multimedia communications. Students have to be theoretically prepared for them and to make a report for each exercise. The course continuous assessment is made during the laboratory exercises by assigning particular tasks and verifying their accomplishment, accepting the practical exercise reports. Students are consistently consulted about the lecture material. Student duties outside lecture and exercise halls include studying the lecture notes, preparing for the practical exercises and making the reports.

S03115 Multiplexing systems

ECTS credits: 5 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Adriana Naydenova Borodzhieva, MEng, PhD; Dept. of Telecommunications,
tel.: (+359 82) 888 734, E-mail: aborodzhieva@uni-ruse.bg
Principal Lecturer Ivanka Dimitrova Tsvetkova, MEng, PhD; Dept. of Telecommunications,
tel.: (+359 82) 888 836, E -mail: itsvetkova@uni-ruse.bg
Abstract:
The course “Multiplexing Systems” has the objective to acquaint the students with the characteristics, organization, functioning, and usage of the multiplexing and multiplexing systems. Multiplexing is a process that combines several signals for simultaneous transmission on one transmission channel. Most of the transmission systems in the telecommunications network contain more capacity than is required by a single user. It is economically feasible to utilize the available bandwidth of optical fiber, coaxial cable, or a radio system in a single high-capacity system shared by multiple users.
Course content:
The main concepts of multiplexing systems. Frequency-division multiplexing. Time-division multiplexing. The main concepts of the optical multiplexing systems (dense wavelength-division multiplexing, DWDM). Digital lines. Line coding. DSL technology. Plesiochronous transmission hierarchy. Synchronous transmission hierarchy. High-level multiplexing in packet-switching networks.
Teaching and assessment:
The topics of the lectures give the possibility to the students to get acquainted theoretically with the main issues of the multiplexing systems before doing the practical exercises. Students investigate the main characteristics of the multiplexing signals with different parameters, using the available laboratory installations and measurement instruments. Lectures discuss mainly the principles of multiplexing theory, while the practical exercises pay attention to the main characteristics of the multiplexing signals. Method of assessment: 2 hours of written and oral examination.

SB13695 Radio Communication Technologies

ECTS credits: 5 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Plamen Zlatkov Zahariev, PhD, MEng, Dept. of Telecommunications, tel.: (+359 82) 888 663;
E-mail: pzahariev@uni-ruse.bg
Principal Assistant Ivanka Dimitrova Tsvetkova, PhD, MEng; Dept. of Telecommunications,
tel.: (+359 82) 888 836, E -mail: itsvetkova@uni-ruse.bg
Abstract:
The course includes various topics, including: high-frequency resonation and power amplifiers, intermediate amplifiers, electronic harmonic generators and etc. Within the course, the students will have to use the knowledge they have obtained from the subjects Signals and Systems and Communication Circuits. The knowledge acquired by the students from this course will be used in the courses Wireless technologies for data transmission and Mobile cellular radio networks, as well as during the development of their theses. The course provides information about the components and characteristics of radio communication equipment, which are necessary for their design and use. The practical exercises are specialized and during them students will develop skills for experimental study of the processes, characteristics and methods for construction of modern radio communications systems and devices.
Course content:
Methods for modulation of signals. General characteristics of radio communication systems. Radio transmitting devices. Radio frequency power amplifiers and electronic harmonic oscillators. Radio receiving devices. Introduction to Wi-Fi, Bluetooth and ZigBee standards. Antennas for wireless communications and antenna analysis methods. Demodulation in radio receiving devices. Diode amplitude detectors.
Teaching and assessment:
The study of the various aspects of the radio communication devices and systems is performed using specialized software and laboratory sets, as well as the specialized devices of the department of Telecommunications (including a radiofrequency spectrum analyzer GWinstek GSP- 730, a signal generator GWinstek GRF- 1300, ME1300-300 Training kit antennas, ME1100-300 Training kit digital RF communications, ME1000-300 Training kit analog RF communications, Keysight 2-channel Oscilloscope, Keysight 20MHz Waveform generator, Keysight Spectrum analyzer 3GHz, Keysight N9310A RF Signal Generator, Gwinstek 9Ghz Microwave Spectrum Analyzer and Gwinstek 4Ghz Cable and antenna RF Analyzer).

S03123 Optoelectronics and Optical Communications

ECTS credits: 3 **Weekly workload**: 1l+0s+0lab+1pr
Assessment: Continuous assessment **Type of exam**: written and oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Department of Telecommunications, tel. (+359 82) 888 839,
E-mail: tiliev@uni-ruse.bg
Abstract
The course aims at familiarising the students with complex theoretical, methodological and apparatus problems in resent optoelectronics & optical communications, at introducing the students in different application areas of optoelectronics devices in optical communication systems. The laboratory and object exercises aim at creating skills for experimental investigation of optoelectronics phenomena and solving of practical problems in the field of optical communications.
Course content:
Basic properties and characteristics of optical radiation in real optical media; different types of optical fibers and cables; optical sources and photo receivers for optical cable communication systems; passive optical elements for optical cable communication systems; optical cable communication systems' building; measurements in optical cable communication systems'. The accent puts on elemental composition and working principles of optoelectronics devices, their basic parameters and specific application area in telecommunications.
Teaching and assessment:
Lectures give the main theoretical material, supported by some demonstrations of optoelectronics phenomena and processes. At the laboratory & object exercises the student works independently and investigates particular optoelectronics phenomena, optoelectronics elements, devices and systems. The knowledge on material of lectures and exercises is tested regularly. The final mark is formed after a discussion with the student. At the exam the students answer two theoretic questions and one laboratory exercise.

SB13696 Course Project on Radiocommunication technologies

ECTS credits: 2
Weekly workload: 0l+0s+0lab+0p+3,0cp
Assessment: defence
Type of exam: written and oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Plamen Zlatkov Zahariev, PhD, MEng, Dept. of Telecommunications, tel.: (+359 82) 888 663;
E-mail: pzahariev@uni-ruse.bg
Principal Lecturer Ivanka Dimitrova Tsvetkova, PhD, MEng; Dept. of Telecommunications,
tel.: (+359 82) 888 836, E -mail: itsvetkova@uni-ruse.bg
Abstract:
The Course Project on Radio communication technologies is included as mandatory in the curriculum of the specialty Internet and mobile communications for the students III year. The students consolidate their knowledge from the subjects Radio communication technologies and Radio waves, antennas and microwave techniques and develop skills to solve independently engineering task for the design of radio communication devices. The subject is also in connection with the thesis design and development of the students.
Course content:
The aim of the course project is for students to master the methods and tools for analysis and design of devices used in radio communication systems. The project is formed in a volume of about 20 pages - an explanatory note, engineering sizing of all electrical circuits, functional block diagram and schematic electrical diagram of the designed device.
Teaching and assessment:
Each student receives an individual assignment and methodological instructions for developing a course project on Radio communication technologies. In the course of the semester individual consultations are provided weekly and systematic monitoring of the project work is executed. The semester certification determines that the minimum technical requirements are met and the student has worked on the project systematically. When ready, the project is defended.

S03116 Teletraffic Engineering

ECTS credits: 6
Weekly workload: 2l+0s+0lab+2pr
Assessment: Exam
Type of exam: written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Adriana Naydenova Borodzhieva, MEng, PhD; Dept. of Telecommunications,
tel.: (+359 82) 888 734, E-mail: aborodzhieva@uni-ruse.bg
Prof. Teodor Bozhidarov Iliev, MEng, PhD; Dept. of Telecommunications, tel. (+359 82) 888 839,
E-mail: tiliev@uni-ruse.bg
Abstract
The course “Teletraffic Engineering” aims to acquaint students with the basic principles for modeling, research, and design of telecommunication systems and electronic services in communication networks.
Course content:
Issues related to the theory of traffic in communication networks and systems are considered. The properties and characteristics of teletraffic systems and communication networks are modeled. Markov and non-Markov distributions of incoming call flows and teletraffic systems with losses and waiting are studied. The stochastic teletraffic processes are analyzed in single-channel systems, full access beam with waiting, and multi-dimensional service systems.
Teaching and assessment:
During the lectures, the main questions included in the curriculum are presented, emphasizing the basic principles for modeling, research, and design of telecommunication systems. The practical exercises are designed for a full assimilation of the studied material, by solving specific engineering tasks related to traffic flows, fully accessible systems, and simulation models of telecommunication systems.

SB17731 Automatic Control Systems

ECTS credits: 6 **Weekly workload**: 2l+0s+0lab+2pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Automatics and Electronics.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Assoc. Prof. Donka Ilieva Ivanova, PhD, MEng, Dept. of Automatics and Electronics, tel.: (+359 82) 888 266, E-mail: divanova@uni-ruse.bg
Principal Lecturer Martin Plamenov Deyanov, PhD, MEng; Dept. of Automatics and Electronics, tel.: (+359 82) 888 266, E-mail: mdejanov@uni-ruse.bg
Abstract
The aim of the course is to give knowledge and practical skills for modelling, analysis and synthesis of linear continuous-time control systems. Prerequisites to this course are the Mathematics, Electrical Engineering and Electronics courses. The acquired knowledge has application in various fields of engineering. It is also a basis for a number of courses in which automatic control systems and their elements are studied.
Course content:
Control systems: basic concept and definitions, classifications. Control systems design process. Mathematical models of linear continuous-time control systems: differential equations, transfer functions, block diagrams. Time-domain and frequency-domain characteristics. Stability analysis. Steady-state errors. Dynamic performance analysis. P, PI, PD and PID controllers. Digital controllers. Control systems design methods.
Teaching and assessment:
The lectures present the theoretic aspects of the addressed problems and illustrate them with appropriate examples. The aim of the practical exercises is to teach the students to apply the acquired knowledge creatively. They are conducted with the aid of MATLAB software system. The students' progress is checked in each exercise throughout the semester. The course ends with a written exam which consists of problem solving and question answering. In order to be allowed to take the exam the students have to attend all the exercises. The practical exercises mark is taken into consideration when forming the final course mark.

SB16291 Economics

ECTS credits: 4 **Weekly workload**: 2l+1s+0lab+0pr
Assessment: Continuous assessment **Type of exam**: written
Departments involved:
Department of Economics.
Faculty of Business and Management.
Lecturers:
Assoc. Prof. Natalia Todorova Nedelcheva, DSc, Dept. of Economics, tel.: (+359 82) 888 416;
E- mail: nnedelcheva@uni-ruse.bg
Abstract:
The subject is concerned with the general problems, laws and categories of the contemporary market economy. Thus it creates a certain basis for the remaining economic objects. It also gives general knowledge, which is expressed in alternative ways of economic viewing and which forms and creates abilities for independent and expert choice in economic surroundings. Course prerequisite is knowledge of mathematics and it is related to concrete branch and functional economic subjects.
Course content:
Introduction – the economic system and the fundamentals of economic theory. Market mechanism. Public sector. Consumer demand and behaviour. Manufacture, company assets and expenses. Imperfect competition and supplying. Price formation and incomes depending on production factors: Gross domestic product and economic growth. Economic cycles, unemployment and inflation. Taxation, budget and monetary policy.
Teaching and assessment:
Material is taught in two ways – lectures and practical classes, which elucidate and develop further some of the issues discussed at lectures. Continuous assessment is carried out. It includes two test assignments and student performance during the semester. Final assessment is the average of the above-mentioned components of evaluation.

S03104 Power Supply

ECTS credits: 6 **Weekly workload**: 2l+0s+0lab+2pr
Assessment: Exam **Type of exam**: written test
Department involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, MEng, PhD; Dept. of Telecommunications, tel. (+359 82) 888 839,
E-mail: tiliev@uni-ruse.bg
Principal Assistant Ventsislav Petkov Keseev, PhD, MEng; Dept. of Telecommunications,
tel.: (+359 82) 888 831; E-mail: vkeseev@uni-ruse.bg
Abstract:
The course objective is to acquaint students with different kinds of electric energy converters, which implement the electrical power supply of various electronic systems and devices. The course topics concern the most common electronic converters of electric energy, such as current rectifier schemes under different loads, methods for rectified voltage regulation, voltage converters and voltage and current stabilizers.
Course content:
Rectifier schemes. Various charge character analysis and basic correlations. Controllable rectifiers. Filters. Parametric stabilizers. Linear and pulse stabilizers. Electronic protections.
Teaching and assessment:
The students work on one topic at every practical exercise and afterwards a report is made. Continuous assessment is made during exercises, students are examined orally and they present their reports.

S03122 Routing and Switching

ECTS credits: 6 **Weekly workload:** 2l+0s+0lab+2pr+1,0ca
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Georgi Valentinov Hristov, PhD, MEng; Department of Telecommunications, tel.: (+359 82) 888 663,
E-mail: ghristov@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, PhD, MEng; Department of Telecommunications,
tel.: (+359 82) 888 353, E-mail: dkyuchukova@uni-ruse.bg
Abstract:
The goal of the course is to familiarizing students with the specifics and features of routing protocols used in IP-based networks. Lectures cover the reason for the complexity of routing algorithms - coordination between the different units in the network, overload of communication channels, etc. The lectures also include interior routing protocols (within Autonomous system) and exterior routing protocol (between Autonomous systems). In addition a number of practical problems are discussed during the lectures. The lectures let the students know about different kind of method and techniques, which solute the above problems.
Course content:
Switching Process in IP networks. Virtual Local Area Networks. VLAN trunking protocol. Spanning Tree Protocol. Inter VLAN routing. Routing data and packet forwarding. Graph Theory. Dijkstra's algorithm – shortest path calculation. Bellman–Ford algorithm – shortest path calculation. Routing Table theory. Static and Dynamic routing. Interior Routing Protocols. Exterior Routing Protocols.
Teaching and assessment:
The topics of the lectures give the possibility to the students to get acquainted theoretically with the main issues of the communication networks. Students have the availability to practice their knowledge during the planed exercises. The department of Telecommunications has equipped laboratories with CISCO devices. During the practice, students create simulated models of communication networks, which are then investigated.

S03124 Course Project on Teletraffic Engineering

ECTS credits: 2 **Weekly workload**: 0l+0s+0lab+0pr+3,0cp
Assessment: defense **Type of exam**: written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Adriana Naydenova Borodzhieva, MEng, PhD; Dept. of Telecommunications,
tel.: (+359 82) 888 734, E-mail: aborodzhieva@uni-ruse.bg
Prof. Teodor Bozhidarov Iliev, MEng, PhD; Dept. of Telecommunications, tel. (+359 82) 888 839,
E-mail: tiliev@uni-ruse.bg
Abstract
The course project on “Telecommunication Engineering” aims to strengthen the knowledge of the students of the specialty “Internet and Mobile Communications” on the basic principles of modeling, research, and design of telecommunication systems and networks.
Course content:
The main idea of the course project is to connect the functional capabilities related to the theory of traffic in communication networks and systems, and on the other hand, to their application in the modeling of the properties and characteristics of teletraffic systems and telecommunication networks.
Teaching and assessment:
The course project is designed for the full assimilation of the studied material, by solving specific engineering tasks related to traffic flows, fully accessible systems, and simulation models of telecommunication systems.

S03125 Practical Training 2

ECTS credits: 4 **Weekly workload**: 4 weeks, 120 hours
Assessment: Colloquium **Type of exam**: written report
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Department of Telecommunications,
tel. (+359 82) 888 839, E-mail: tiliev@uni-ruse.bg
Abstract:
The aim of the course Practical Training 2 is to assimilate the acquired theoretical knowledge and practical skills of the students from the specialty Internet and mobile communications, and to obtain new specific knowledge and skills in the conditions of real working firms and organizations engaged in design, introducing, exploitation and maintenance of communication-information systems, etc.
Course content:
Introduction to the structures, character and the assignments of the different subdivision in a specific organization. Studying the widespread communication-information systems, their constructive and technological parameters and characteristics, functional potentialities and exploitation special features. Direct participation depending on trainee-official position in the exploitation and maintenance of the communication equipment.
Teaching and assessment:
The practices is organized in the period fixed according to schedule of the educational process. The practice is realized in enterprises, firms, organizations with modern well-appointed manufacture or in organizations where contracts for practical training are concluded. The practice can be carried out in en enterprise offered by the student but on condition that the enterprise is with necessary equipment allowing the realization of practice aims and tasks (with tutor’s permission).

SB13697 Network Administration and Management

ECTS credits: 5
Weekly workload: 2l+0s+0lab+2pr
Assessment: Exam
Type of exam: written and oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Plamen Zlatkov Zahariev, PhD, MEng, Dept. of Telecommunications, tel.: (+359 82) 888 663;
E-mail: pzahariev@uni-ruse.bg
Abstract:
The course in Network administration and management provides to the students theoretical information and is expected to develop new and to strengthen their already acquired practical skills on key issues related to the network administration, the use of server operating systems, the processes of installation, configuration and management of the OS. The course develops skills for independent solving of engineering and technical tasks related to the design, modelling and development of specialized local area networks, network clusters with Active Directory, Domain controllers, local data arrays, etc.
Course content:
The course focuses on modern server operating systems and their installation processes, the structure and the function of the active directory and the domain controller, configuration and provision of DHCP and DNS services to the users, the use of group security policies and the use of virtualization technologies.
Teaching and assessment:
The lectures are conducted every week and are preceding the practical exercises. All lectures are presented to the students using multimedia presentations. The exercises are conducted two hours per week in a specialized laboratory and using the necessary specialized equipment.

S03127 Telecommunication Security

ECTS credits: 4
Weekly workload: 2l+0s+0lab+1pr+0,5rep
Assessment: Exam
Type of exam: written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Plamen Zlatkov Zahariev, PhD, MEng, Dept. of Telecommunications, tel.: (+359 82) 888 663;
E-mail: pzahariev@uni-ruse.bg
Abstract:
The Telecommunication Security course is mandatory for the students in the Internet and Mobile Communications Bachelor degree. The study objectives within the discipline are focused on the problems related to the information security and the data protection in the communication networks and systems. The objectives of the course are focused on the acquisition of theoretical and practical knowledge and skills in the areas of the cryptography, the network and the telecommunication security by the students.
Course content:
Basic principles and concepts of network security, Symmetric and asymmetric cryptography, Hash functions, digital signatures and certificates, PKI, Identity management, security in different levels of the TCP/IP stack; Risk management and security policies; Applications security and penetration testing; Basic work with Backtrack and Kali Linux; Analysis of network packets with Wireshark; Firewalls and Access Control Lists (ACL); Virtual private networks (VPNs), etc.
Teaching and assessment:
The teaching process is divided into lectures and practical exercises. The lectures are two hours long and the topics are related to the practical exercises. The exercises are two hours long and are conducted every odd week. At the beginning of each practical exercise, the theoretical knowledge of the students is evaluated. The students have to prepare a brief essay on a topic from the course subjects. The course finishes with an written exam.

S01530 Multimedia Systems and Technologies

ECTS credits: 4 **Weekly workload**: 2l+0s+0lab+1pr+1,0ca
Assessment: Continuous assessment **Type of exam:** written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Tsvetozar Stefanov Georgiev, PhD, MEng, Dept. of CST, tel.: (+359 82) 888 711;
E-mail: TGeorgiev@ecs.uni-ruse.bg
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Department of Telecommunications,
tel. (+359 82) 888 839, E-mail: tiliev@uni-ruse.bg
Abstract:
The objective of the course Multimedia systems and technologies is to familiarise students with the technology to create multimedia products, comprising text, graphic, audio and video objects according to a scenario prepared in advance, as well as with the structure of the systems for developing and recreating such products. The course examines basic graphic, sound and video file formats and compression methods and the use of some popular authoring systems. The course has input links with the courses Web design and Programming languages, and parallel with Applications and systems for mobile terminals and devices.
Course content:
Multimedia – history, definitions, application area. Technology of creating multimedia products. Systems for developing multimedia products. Methods and tools for creating, editing and saving text objects. Methods and tools for creating, compressing, editing and saving graphic objects. Methods and tools for creating, compressing, editing and saving audio objects. Methods and tools for creating, compressing, editing and saving video objects. Assembling, testing and distribution of multimedia applications. Video-conferencing systems. Virtual reality.
Teaching and assessment:
The lectures familiarise students in theory with the main problems of creating multimedia products. The workshops allow each student to develop multimedia objects and include in multimedia product following a given scenario. The students must develop multimedia course project based on the given task. The assessment is continuous. The final mark is the average of the marks of two tests, personal participation in class works and the mark of the course task.

SB13698 Programming of Mobile Devices

ECTS credits: 4 **Weekly workload: :** 2l+0s+0lab+1pr+1,0ca
Assessment: Continuous assessment **Type of exam:** written and oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Plamen Zlatkov Zahariev, PhD, MEng, Dept. of Telecommunications, tel.: (+359 82) 888 663;
E-mail: pzahariev@uni-ruse.bg
Abstract:
The Programming of mobile devices course provides the students with the theoretical foundations and the basic practical knowledge, which are necessary for the development of modern applications for mobile devices and terminals that use and function on the Android operating system. Within the course, the students can use knowledge gained from the courses Object Oriented Programming and Programming Languages. The knowledge gained from this course can be used in the courses Mobile Cellular Radio networks and Operating systems and network protocols, as well as for the preparation of the final diploma thesis project. The knowledge gained from this course can be additionally used as foundation for the courses from the Master degree programs in Computer systems and networks, Computer Technology and Internet and Mobile Communications.
Course content:
The course contains lectures and exercises related to the main components of the mobile applications, the workflows for development of applications with Android Studio, the use of various elements, screen layouts, menus, processes, etc. The main methods for navigating within the applications, for switching between individual activities within an application, and for switching between applications are analysed and presented within the course. The different methods for entering, processing, transmission and visualisation of information are also discussed and presented. The methods for using the hardware components of the mobile devices (camera, GPS, compass, accelerometer, communication interfaces, etc.) are described within the course. The processes for development and installation of applications on virtual and real mobile devices with Android OS are also presented and discussed.

Teaching and assessment:
The lectures are held every week in blocks of two study hours and precede the corresponding practical exercises. All lecture topics are presented to the students in the form of multimedia presentations. The exercises are taking place every even week and are two study hours long, with just the last exercise being 3 study hours long. At the beginning of the semester, each student receives an individual topic for the development of the course assignment. Weekly consultations are held where the students can present their results and receive guidance. A course assignment is developed independently by each student. The course assignment is prepared in a document with a volume of between 12 and 20 pages – a short project with a theoretical and practical part, diagrams, tables, etc. The submission of the assignment must be done by the end of the 15th week of the semester.

SB10672 Television Systems

ECTS credits: 6 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Exam **Type of exam:** written
Departments involved:
Department of Telecommunication.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Dept. of Telecommunication, tel.: (+359 82) 888 839;
E-mail: tiliev@uni-ruse.bg
Abstract:
The subject Television Systems has the objective to acquaint the students with the perceptual properties of human vision, representation of color features, mapping of motion into image plane, segmentation and decomposition of video signals. In the second part of the subject attention is paid to the television signals and their properties, types of broadcasting networks. The technical operation of contemporary displays and TV receivers, principles of color television standards are discussed.
Course content:
Physical fundamentals of television systems. Principles of television. Properties of television images. Television signal and its properties. Systems for color television. Cable broadcasting TV networks. Principles and properties of Light-Signal and Signal-Light transformers. Basic parameters and properties of flat screen displays. Various types of flat screen displays.
Teaching and assessment:
The topics of the lectures give the possibility to the students to get acquainted theoretically with the main issues of the fundamentals of television, before doing the practical exercises. Students investigate the characteristic of the television signals, using the available laboratory installations and measure instruments. Lectures discuss mainly the fundamentals of television, while the practical exercises pay attention to the characteristics of television signals.

S03130 Wireless Technologies for Data Transfer

ECTS credits: 5 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Plamen Zlatkov Zahariev, PhD, MEng, Dept. of Telecommunications, tel.: (+359 82) 888 663;
E-mail: pzahariev@uni-ruse.bg
Abstract:
The course Wireless technologies for data transfer aims to strengthen the knowledge of the students and to present to them the major issues of wireless computer and telecommunications networks. The knowledge, the materials and the tasks during the course will help the students to develop skills for solving of engineering and technical tasks for design, modelling and development of wireless networks and the selection and configuration of network equipment and devices. The course Wireless technologies for data transfer uses knowledge from the courses Data Transmission and Computer Communications, Telecommunication security, Radiocommunication technologies, etc. The knowledge, gained from this course can be used in other engineering courses in the field of the telecommunication networks, the network devices and systems and would help the students during the preparation of their bachelor theses.
Course content:
The course presents different networking technologies, modulation techniques, topologies and devices, which can be used and implemented for and in the wireless networks. A detailed presentation and analysis of the modern standards for wireless communications is also provided. Some of the standards, which are included in the course are: IEEE802.11 (WiFi), IEEE802.15 (802.15.1 Bluetooth, 802.15.3 WiMedia, 802.15.4 ZigBee) and

IEEE802.16 (WiMax). The students gain knowledge about the methods for planning of the wireless networks, for development of an address plan and for setting up the devices.

Teaching and assessment:

The lectures are conducted every week and are preceding the practical exercises. All lectures are presented to the students using multimedia presentations. The exercises are conducted on block in a specialized laboratory and using the necessary specialized equipment.

SB10673 Computer Vision

ECTS credits: 5 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Exam **Type of exam:** written

Departments involved:

Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation

Lecturers:

Assoc. Prof. Irena Marinova Valova, PhD, MEng; Dept. of Computer Systems and Technologies;
tel.: (+359 82) 888 685, E-mail: Irena@uni-ruse.bg
Assoc. Prof. Yordan Ivanov Kalmukov, PhD, MEng, Dept. of CST, tel.: (+359 82) 888 681;
E-mail: jkalmukov@uni-ruse.bg

Abstract:

The course Wireless technologies for data transfer aims to strengthen the knowledge of the students and to present to them the major issues of wireless computer and telecommunications networks. The knowledge, the materials and the tasks during the course will help the students to develop skills for solving of engineering and technical tasks for design, modelling and development of wireless networks and the selection and configuration of network equipment and devices. The course Wireless technologies for data transfer uses knowledge from the courses Communication Networks and Systems, Data Transmission and Computer Communications and Routing and Switching in the communication networks. The knowledge, gained from this course can be used in other engineering courses in the field of the telecommunication networks, the network devices and systems and would help the students during the preparation of their bachelor theses.

Course content:

The course presents different networking technologies, modulation techniques, topologies and devices, which can be used and implemented for and in the wireless networks. A detailed presentation and analysis of the modern standards for wireless communications is also provided. Some of the standards, which are included in the course are: IEEE802.11 (WiFi), IEEE802.15 (802.15.1 Bluetooth, 802.15.3 WiMedia, 802.15.4 ZigBee) and IEEE802.16 (WiMax). The students gain knowledge about the methods for planning of the wireless networks, for development of an address plan and for setting up the devices.

Teaching and assessment:

The lectures are conducted every week and are preceding the practical exercises. All lectures are presented to the students using multimedia presentations. The exercises are conducted on block in a specialized laboratory and using the necessary specialized equipment.

S03132 Course Project Communication Networks and Systems

ECTS credits: 2 **Weekly workload**: 0l+0s+0lab+0pr+3,0cp
Assessment: defence **Type of exam**: written and oral

Departments involved:

Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.

Lecturers:

Prof. Georgi Valentinov Hristov, PhD, MEng; Department of Telecommunications, tel.: (+359 82) 888 663,
E-mail: ghristov@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, PhD, MEng; Department of Telecommunications,
tel.: (+359 82) 888 353, E-mail: dkyuchukova@uni-ruse.bg

Abstract:

The course objective is to provide the students with working knowledge of the basic tasks, principles and methods used in telecommunication networks, as well as their main areas of application. The lectures include architecture, functionality, interfaces and protocols, which are main part of the modern telecommunication networks. Students consolidate knowledge on Communication networks and systems and Routing and switching in communication networks and develop skills to independently solve engineering task for the design and maintenance of the telecommunications network.

Course content:

Design of telecommunication network and implement static routing. Design of telecommunication network and implement dynamic routing. LAN Design. Segment LAN into virtual local area networks. Design of

telecommunication network for IPv4 – IPv6 coexistence. Design of telecommunication network with improve network security. Implement Access Control Lists.

Teaching and assessment:

Each student receives an individual assignment and methodological instructions for developing a course project at Communication networks and systems. In the course of the semester individual consultations are provided weekly and systematic monitoring of the project work is executed. The semester certification determines that the minimum technical requirements are met and the student has worked on the project systematically. When it is ready, the project is defended.

S03133 Course project Television Systems

ECTS credits: 2 **Weekly workload**: 0l+0s+0lab+0pr+3,0cp
Assessment: defence **Type of exam**: written and oral
Department involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Department of Telecommunications,
tel. (+359 82) 888 839, E-mail: tiliev@uni-ruse.bg
Abstract:
The project Television systems has the objective to assimilate the knowledge of the students with the perceptual matter of television systems. It forms skills for independent solving of engineer technical tasks of television systems development, which do various analog and digital signal processing. The project uses the knowledges acquired in the subject Television systems.
Course content:
The project must contain a graphical part including a schematic of the designed television systems, specifications of the used building blocks, references and a list of terms and abbreviations.
Teaching and assessment:
In the beginning of the term each student receives an individual task. The students present intermediate results and received instructions for his future work weekly. The project is realized independently by the students.
The volume of the final form of the project must be between 15-20 pages, including block schemes, principle diagrams and engineer computation of all electrical circuits of the designed system.

SB10677 Mobile Cell Radio Networks

ECTS credits: 4 **Weekly workload: :** 2l+0s+0lab+2pr
Assessment: Exam **Type of exam:** written test
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Dept. of Telecommunication, tel.: (+359 82) 888 839;
E-mail: tiliev@uni-ruse.bg
Principal Lecturer Ivanka Dimitrova Tsvetkova, PhD, MEng; Dept. of Telecommunications,
tel.: (+359 82) 888 836, E -mail: itsvetkova@uni-ruse.bg
Abstract:
The course introduces the students with the basic standards, principles and technologies of the mobile cell radio networks. The focus of the discipline is on digital systems and technologies for mobile communications, including architecture, interface and protocol organization, technologies, services and more. They are considered from GSM to 5G, as well as their main functional network elements.
Course content:
Introduction to mobile cellular radio networks: classification, general characteristics, basic principles in mobile cellular radio networks. Global System for Mobile Communications (GSM). Third generation mobile communication systems (3G). Fourth generation LTE systems. LTE architecture. LTE interfaces. Basic communication functions. Protocol stacks on the control and user planes. Logical and transport channels in LTE. Mobility management. Features and comparison between 4G and 5G. 4G and 5G network applications. Fifth generation systems (5G). Characteristics and features of the network. Communication between devices, standards, structure and services in fifth generation (5G) systems. 5G architecture and protocols. 5G New Radio (5G NR) - features and specifications. Next generation mobile cellular radio networks.
Teaching and assessment:
The lectures are conducted 2 hours weekly, and the practical exercises are 2 hours. The students are preparing for the exercises, using the recommended literature.
Method of Assessment: 90 minutes a written test.

S03136 Digital Signal Processors

ECTS credits: 3 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Continuous assessment **Type of exam:** written and oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, PhD, MEng; Dept. of Telecommunications; tel.: (+359 82) 888 823;
E-mail: nina@uni-ruse.bg
Abstract:
The subject Digital Signal Processors has the objective to familiarize the students of the “Information and Communication Technologies” degree course with the architecture of digital signal processors (DSP) as well as with integrated development environments for simplify DSP system configuration and application design. The subject Digital Signal Processors is related to the subjects “Impulse and Digital Devices”, “Digital Signal Processing”, “Microprocessor systems”, and to the diploma project.
Course content:
Key features of the TMS320C54X DSP family. DSP architecture. Bus structure. Central Processing Unit. Memory organization. Data addressing. Program memory addressing. Pipelining. On-Chip Peripherals. Host Port. Serial ports. DSP applications.
Teaching and assessment:
The lectures mainly concentrate on the hardware, while the emphasis of the practical exercises is on the development of software for microprocessor systems based on DSP. The practical works are carried out in a computer laboratory equipped with specialized demonstration boards and a DSP developing environment based on PC. At the beginning of each laboratory exercise an entrance test is conducted to check the students’ preparation. At the beginning of the term each student is given an individual assignment. It has to be presented and defended orally at the end of term. The final mark is based on the results of the exam and test results during lectures and exercises.

SB10678 Operating System and Networks protocols

ECTS credits: 3 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Exam **Type of exam:** written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Department of Telecommunications,
tel. (+359 82) 888 839, E-mail: tiliev@uni-ruse.bg
Principal Assistant Ivanka Dimitrova Tsvetkova, PhD, MEng; Dept. of Telecommunications,
tel.: (+359 82) 888 836, E -mail: itsvetkova@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, PhD, MEng; Department of Telecommunications,
tel.: (+359 82) 888 353, E-mail: dkyuchukova@uni-ruse.bg
Abstract:
The course Operating Systems and Networks Protocols acquaints students with the currently used operating systems, the way they are built and operated, as well as the high-level protocols used in them. The lectures are organized in two main blocks. The first block includes an introduction to operating systems. The second block of lectures includes network protocols. The knowledge and experience gained in this course may be useful for the BSc thesis and research work.
Syllabus contents:
The introduction to operating systems covers issues related to the structure of operating systems, memory allocation, process interaction, input and output disk operations, as well as typical errors and ways to diagnose and troubleshoot them.
The network protocols discussed in the lectures allow students to gain knowledge and skills about the most commonly used high-level protocols and services based on them, the configuration and features of servers and client products through which these services are provided and accessed.
Teaching and learning methods:
The course includes 2 weekly hours of lectures and 2 hours of workshops. The workshops are held in a computer lab with PCs running Microsoft Windows.
Method of Assessment: 90 minutes a written exam.

SB10679 Convergent Networks

ECTS credits: 3 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Georgi Valentinov Hristov, PhD, MEng; Department of Telecommunications, tel.: (+359 82) 888 663, E-mail: ghristov@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, PhD, MEng; Department of Telecommunications, tel.: (+359 82) 888 353, E-mail: dkyuchukova@uni-ruse.bg
Abstract:
The main objective of this course is to provide students with in-depth understanding of Next Generation Network (NGNs) technologies. The course will cover history, overview, and how NGNs are shaping the current and future ICT landscape. Students will gain both a theoretical understanding and practical experience from laboratory work concerning the design and delivery of systems employing programmable networking technologies. The stress is put on networking APIs, SIP, IMS and converged service delivery platforms. There is a strong research and experimental aspect to this course. Students are expected to work with various NGNs technologies APIs to gain understanding in various architectural and programming aspects of NGNs and complex web and cloud-based technologies that combine various media and access network protocols.
Course content:
Students are expected to read on various topics related to NGNs and provide their own understanding of the following topics that will be covered during the lectures (the order is subject to change during the first year of the course): Historical background to present day networks; Circuit switching vs. packet switching, session control; Concepts of network evolution and convergence; Synchronous vs. asynchronous communication; Event-driven computing, parallel processing and threading; Application servers and container architectures; Reference models for current state of networks; Abstract layering model for NGNs; IP Multimedia Subsystem (IMS); The OSI-RM layers; SIP as an integrating protocol for NGNs; Application programming interfaces; OSA/Parlay; Parlay X; JAIN Operations support systems; Migration from legacy systems to NGNs; Case studies of present and possible future applications deployed in NGNs.
Teaching and assessment:
The lectures are conducted 2 hours weekly, and the practical exercises are 2 hours every week. The students are preparing for the exercises, using the recommended literature. For each exercise the students prepare and present to the teacher a report. The exam consists of written and oral parts.

SB10680 Databases

ECTS credits: 3 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Continuous assessment mark **Type of exam:** written
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Adriana Naydenova Borodzhieva, MEng, PhD; Dept. of Telecommunications, tel.: (+359 82) 888 734, E-mail: aborodzhieva@uni-ruse.bg
Assoc. Prof. Irena Marinova Valova, MEng, PhD; Dept. of Computer Systems and Technologies, tel.: (+359 82) 888 685, E-mail: Irena@ecs.uni-ruse.bg
Abstract:
The aim of the course “Databases” is to acquaint students with the basic theory and practice of databases, including the design, implementation, and use of databases. The relational data model and SQL as the standard language for working with relational databases are considered. An appropriate system for managing databases and respectively environment for writing an SQL code are chosen for the practical exercises.
Course content:
As a result of the course, students should know what database management systems and relational databases are; be able to write SQL code for the basic operations of relational databases; use aggregate and grouping functions; write queries with subqueries; be able to implement all the above knowledge and skills to solve real problems from practice.
Teaching and assessment:
The course includes lectures and practical exercises. During the lectures, students are introduced to the theoretical foundations of the material, which is accompanied by suitably selected tasks from practice, adapted to their specialty. During the exercises with the help of specialized software for writing SQL code, students can test examples from the lectures and solve their specific problems. Students are required to be prepared for the exercises by reviewing the material taught during the lectures, and the examples given.

SB13699 Video Communication Technologies

ECTS credits: 3 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Continuous assessment **Type of exam:** written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Department of Telecommunications,
tel. (+359 82) 888 839, E-mail: tiliev@uni-ruse.bg
Abstract:
The subject Video Communication Technologies has the objective to acquaint the students with the principles and adjustment of contemporary digital video cameras, systems for video recording, optical systems in video cameras, compression of video and audio signals, basic principles of data compression, principles of video recording and playing, basic characteristics of contemporary software systems for video processing and streaming via peer-to-peer networks.
Course content:
Principles and features of contemporary digital video cameras. Setting up and managing digital video cameras. Systems for recording of video signals. Auto white balance systems, auto focus systems, automatic aperture adjustment systems, program auto exposure. Optical system of video cameras. Focus length and field of vision. Field of vision calculation. Principle of operation of the lens. Video formats (RGB, YUV, SIF, CIF и QCIF). Compression of video and audio signals. Basic principles of data compression. Spatial characterization of objects. Light in the frame /light and space, light and form/. Optical interference in the frame. Technical equipment for video editing and processing. Principles of video recording and playing. Reducing the speed of the digital stream in video recording. Digital video recording and video playback devices. Real time streaming systems. Peer-to-peer streaming systems. Types of architectures.
Teaching and assessment:
The topics of the lectures give the possibility to the students to get acquainted theoretically with the main issues of the video communication technologies before doing the practical exercises. Practical exercises focus on the characteristics and processing of multimedia information. Classes are held in a specialized laboratory.

S02003 Digital Television Systems

ECTS credits: 3 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Exam **Type of exam:** written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Department of Telecommunications,
tel. (+359 82) 888 839, E-mail: tiliev@uni-ruse.bg
Abstract:
The subject Digital television systems has the objective to acquaint the students with the characteristics and principle of analog to digital conversion of audio and video signals, technologies and specifications for source and channel coding. In the second part of the subject attention is paid to the digital modulation methods (PSK, QAM, OFDM and 8VSB), most common standards for the digital coding of audio and video signals (MPEG-2, H.264). The digital video broadcasting methods like DVB-T, DVB-C, DVB-S, DVB-H.
Course content:
Principle of analog to digital conversion of component video signal. Methods and technique of Discrete Cosine Transform (DCT). Formats and compression algorithms - MPEG-2 and H.264. Transmission of digital television signal, source and channel coding. Digital modulation methods – PSK, QAM, OFDM and 8VSB. Digital video broadcasting (DVB) – DVB-T (Terrestrial), DVB-C (Cable), DVB-S (Satellite) and DVB-H (Handhelds). Receiving of digital television signal.
Teaching and assessment:
The topics of the lectures give the possibility to the students to get acquainted theoretically with the main issues of the digital television techniques before doing the practical exercises. Students investigate the main characteristic of the digital television signal (BER, MER, carrier/noise, Wrong packets) at different standards, using the available laboratory installations and measure instruments. Lectures discuss mainly the principles of digital television, while the practical exercises pay attention to the main characteristics of digital television signals.

SB10681 Radar systems

ECTS credits: 3 **Weekly workload**: 2l+0s+0lab+2pr
Assessment: Exam **Type of exam:** written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Department of Telecommunications,
tel. (+359 82) 888 839, E-mail: tiliev@uni-ruse.bg
Abstract:
The Radar systems course is eligible for students at the Department of Telecommunication. The object of study is radar systems, which ensure the smooth operation of RIS (River Information Systems). The course aims to equip students with knowledge about the mathematical basics of radar systems, the principles of construction and operation of radar systems, methods of analysis, monitoring and diagnostics of radar systems.
Course content:
Basic concepts and object of the course. General characteristics of radar systems. Concept of "e-Navigation". Structure of system for "e-Navigation". Navigation aids. Automatic Identification System /AIS/. AIS functioning on different information levels. AIS equipment onboard. System for automatic radar tracking / SART /. Navigational-informative system. Preventing collisions of vessels systems. / SPCV /.
Teaching and assessment:
The lectures are two hours per week. The lecture topics are related to practical exercises. The exercises are held for two hours each week. At the beginning of each exercise, the teacher checks out the student knowledges. The course ends with an exam. The assessment during the term allows students to receive regular knowledge.

SB10682 Coding in Telecommunication Systems

ECTS credits: 3 **Weekly workload**: 2l+0s+0lab+2pr
Assessment: Continuous assessment **Type of exam**: written and oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Assoc. Prof. Adriana Naydenova Borodzhieva, MEng, PhD; Dept. of Telecommunications,
tel.: (+359 82) 888 734, E-mail: aborodzhieva@uni-ruse.bg
Abstract
The aim of the course “Coding in Telecommunication Systems” is to introduce the students to the models of the communication systems for data transmission, statistical methods for quantity measurement of information, methods for optimal coding, and the fundamentals of channel coding theory.
Course content:
Probability approach to the measurement of the quantity of the information; unconditional and conditional entropy. Methods for optimal coding of information. Fundamental terms in the field of linear codes and cyclic codes theory. Contemporary block codes. BCH codes. Reed-Solomon codes. Fundamentals of convolutional codes theory. Turbo codes. Application of the cyclic codes in the synthesis of complex wideband signals. Application of the Reed-Muller codes in the communication systems with orthogonal frequency division and multiplexing of the channels.
Teaching and assessment:
Lectures present the teaching material according to the syllabus. Lectures precede practical workshops and provide the necessary theoretical knowledge for them. At the practical exercises, students solve problems covering the topics of the syllabus and perform computer simulations with MATLAB and its extensions. Exercises with modern FPGA-based laboratory models are also planned. The continuous assessment is conducted at the practical exercises by written tests. The final assessment is accomplished via examination, conducted in written and oral form. The final mark is formed based on the material studied at the lectures and exercises.

S00040 State exam

ECTS credits: 10 **Weekly workload:** 0l+0s+0lab+0pr
Assessment: defence / exam **Type of exam**: oral / written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Lecturers from the Department of Telecommunications and experts in the field of telecommunications.
Abstract:
The purpose of the state exam is for students who have completed all the semesters to prove the knowledge and skills acquired in the course of study in the field of telecommunications.
Course content:
Compiling a training program (a schedule for preparation). Collection of literature sources (references) from libraries and the Internet. Summarizing and classifying the collected theoretical materials. Elaboration of all theoretical questions from the exam synopsis. Checking the developed topics and formulating consultation questions. Consultations by lecturers. State Exam.
Teaching and assessment:
The graduate student prepares independently using the attached list of literature sources (references) and the resources of the university and other libraries, computer rooms and own notes.
The state exam is conducted by the State Examination Commission (SEC) appointed by order of the rector. The synopsis for the State Exam contains questions, tasks (problems) or a test on the theoretical material. The state exam is held simultaneously with all graduates appeared. The exam ticket is chosen by the graduate on the day of the exam. The state exam is written with a duration of 4 /four/ astronomical hours.
The assessment is made at a closed meeting of the State Examination Commission, considering the quality and completeness of the written presentation. The state exam ends with a six-point grade.
Graduates who received a grade of Poor (2) on the exam may retake the State Exam during the remedial session according to the curriculum schedule for the academic year.

S03144 Diploma work

ECTS credits: 10 **Weekly workload:** 0l+0s+0lab+0pr
Assessment: defence / exam **Type of exam**: oral / written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Lecturers from the Department of Telecommunications and experts in the field of telecommunications.
Abstract:
The Diploma thesis is an independent creative project. It represents a solution to an engineering task, which is developed under the guidance of a scientific supervisor. The purpose of the development is for students to demonstrate their knowledge and skills acquired during their studies. It enables students completing the educational and qualification degree “Bachelor – Engineer” to demonstrate their abilities to plan and implement projects in the field of telecommunications, to work independently, to show initiative and professional competence. The thesis is presented and defended before the State Examination Commission.
Course content:
The Diploma thesis consists of a written report (an explanatory note), which includes a literature review and analysis of existing solutions to the problem, a description of the proposed solution (used design methods, calculations, etc.), conclusions, and references. The graphical part includes block diagrams, schematic diagrams, diagrams, charts for graphical representation of test results. During the defense, students must demonstrate their developed models or prototypes.
Teaching and assessment:
The Department of Telecommunications is responsible for approving and announcing diploma thesis topics, supervising graduate students, reviewing and organizing public defenses. Students develop the thesis under the guidance of professors from the department or external specialists in the field of telecommunications. The state examination committee evaluates the students' work and defense with two separate grades.

UNDERGRADUATE STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGIES

PROFESSIONAL STANDARDS OF A BACHELOR IN

INFORMATION AND COMNUNICATION TECHNOLOGIES

Degree awarded: **Bachelor of Engineering (BEng)**
Professional Qualification: **Engineer in information and communication technologies**

These standards define the requirements that the education of a Bachelor of Information and Communication Technologies should meet with respect to a successful career. Bachelors should possess fundamental knowledge in a wide range of topics within the Information and Communication Technologies and be qualified for employment in any area where ICT are applied. In order to effectively render their role in the Information Society, bachelors of ICT should possess the following key knowledge and skills:

1. Key theoretical knowledge:

A Bachelor of ICT should:

- have the necessary knowledge in fundamental engineering areas: mathematics, physics, electrical engineering and electronics, digital circuits, electrical measurements, microprocessor systems;
- have in-depth knowledge of the fundamental principles, architectures and functioning of computer and telecommunication systems;
- have in-depth knowledge of the system and application software of computer and telecommunication systems;
- have good command of the methods and tools for software development under different operating systems;
- be familiar with the theory of computer networks and communications, network and computer security, networking protocols;
- be familiar with the theory of databases and information systems, digital communication media, wireless technologies for data transfer;
- have good foreign language skills - good command of the English language and the ability to use another foreign language.

2. Key practical skills:

A Bachelor of ICT should:

- be able to independently solve problems by creatively applying the acquired knowledge, by using advanced methods and tools and by applying complex technical and economic approach;
- be able to carry out research, development, manufacturing, maintenance and service activities, with respect to putting information and communication technologies to practice;
- be able to develop system and application software for universal and specialised computer and communication systems;
- be able to design, build and administer computer and telecommunication networks;

3. Additional knowledge and skills:

A Bachelor of ICT should:

- be aware of legal and ethical aspects of the ICT area;
- have knowledge and skills for business communications and be able to carry out business negotiations and correspondence;
- be able to search, find and use information as part of problem solving in different areas;
- be able to work in a team and to manage projects in the ICT area;
- be able to prepare working and technical documentation, deliver presentations, present their views of specific technical problems and their solutions before various audiences, using modern technical and software tools;
- be able to independently plan and raise their professional qualifications, as well as that of their colleagues, according to the lifelong learning principle.

The Bachelors of Engineering in Information and Communication Technologies acquire knowledge and skills in a wide range of areas, which gives them the opportunity for fast adaptation and successful employment on the world wide labour market.

CURRICULUM
of the degree course in
INFORMATION AND COMNUNICATION TECHNOLOGIES

First year

Code	First term	ECTS	Code	Second term	ECTS
S01604	Higher Mathematics 1	5	S01807	Applied Mathematics	5
SB15447	Programming	8	S00327	Pulse and Digital Devices	6
S00257	Physics	4	S01032	Digital Signal Processing	6
SB17855	Electrical Engineering and Electronics	6	SB17856	Measurements	4
SB15448	3D Technologies	4	SB15451	Object-oriented programming	6
	Elective disciplines (students elect one discipline)			***Elective disciplines (students elect one discipline)***	
S00321	Technical English 1	3	S00431	Technical English 2	3
S00419	English 1	3	S00427	English 2	3
	Total for the term:	**30**		***Total for the term:***	**30**
S00072	Physical Education and Sport	1	S00072	Physical Education and Sport	1

Second year

Code	Third term	ECTS	Code	Fourth term	ECTS
S01567	Data Transmission and Computer Communications	4	S01814	Microprocessor Systems	7
S01609	Computer Organisation	6	S01849	Computer Architectures	6
S01672	Discrete Structures and Modelling	5	S01895	Software Engineering	5
S00345	Sinthesys and Analysis of Algorithms	6	S01970	Databases	5
S01680	Computer graphics	4	S01982	Web Design	5
S01690	Digital communication channels	5	S01984	Project 1	2
	Total for the term:	**30**		***Total for the term:***	**30**
SB13965	Physical Education and Sport	1	SB13965	Physical Education and Sport	1
			S02554	Practical Training 1 (3 weeks)	3

Third Year

Code	Fifth term	ECTS	Code	Sixth term	ECTS
S01985	Networks and Systems	6	S02000	Network Protocols	6
S01990	Specialised Microcomputer Systems	6	S02003	Digital television systems	6
S01991	Artificial intelligence	6	S02004	Information systems	5
SB15486	Routing and switching in communication networks	7	S02007	Digital Signal Processors	6
SB16336	Management	3	S02008	Programming Languages	5
S01999	Project 2	2	S02011	Project 3	2
	Total for the term:	**30**		***Total for the term:***	**30**
S00072	Physical Education and Sport	1	SB13965	Physical Education and Sport	1
			S02562	Practical Training 2 (4 weeks)	4

Fourth Year

Code	*Seventh term*	*ECTS*	*Code*	*Eighth term*	*ECTS*
S02012	Operating systems	5	S02027	Applications and systems for mobile terminals and devices	4
S02015	Network administration	6	S02028	Convergent communication systems	4
S03074	System Programming	6	S02029	Multimedia Systems and Technologies	4
SB15487	Web Programming	5	S02067	Self-dependent training	4
S02020	Project 4	2			
	Elective disciplines (students elect one discipline)			***Elective disciplines (students elect one discipline)***	
S02023	Network and computer security	6	S02072	Wireless technologies for data transfer	4
S02024	Information and communication security	6	S02074	Mobile Cell Radio Networks	4
				Graduation	
			S02075	State exam	10
			S01425	Diploma work	10
	Total for the term:	**30**		***Total for the term:***	**30**
SB13965	Physical Education and Sport	1	S00021	Physical Education and Sport	1

Total for the degree course: 240 ECTS credits

S01604 Higher Mathematics 1

ECTS credits: 5
Workload per week: 2l+2s+0lab+0pr
Assessment: Exam
Type of exam: written
Departments involved:
Department of Mathematics
Faculty of Natural Sciences and Education
Lecturers:
Assoc. Prof. Antoaneta Tileva Mihova, PhD, Department of Mathematics, phone 888 727,
E-mail: amihova@uni-ruse.bg
Assoc. Prof. Yuriy Dimitrov Kandilarov, PhD, Department of Mathematics, phone 888 634,
E-mail: ukandilarov@uni-ruse.bg
Summary:
HIGHER MATHEMATICS is fundamental to engineering education and builds on the studies of Mathematics from secondary education. It is imperative to the students' education in other mathematical subjects as well as in Physics, Electrical engineering and a number of general engineering subjects. The course includes topics from Linear algebra and analytical geometry, Differential and integral calculus of function of one variable.
Course syllabus:
Linear algebra – matrices, determinants, system of linear equations; Vector algebra – vector operations; Plane analytical geometry – line in plane; Differential calculus of function of a variable - derivative of function and applications; Integral calculus – basic integration techniques, integration by parts, definite integral, applications.
Teaching and assessment:
The students get acquainted via lectures with basic mathematical notions. By rule, the theorems do not include proofs but there are many examples and applications given. The seminars develop the students' technical ability for practical problem solving. Students are allowed to use formulas during classes, tests and exam. Students should prepare for the seminars by learning the course material and examples. The exam is considered passed only if the student has solved at least two problems. One of those problems should be chosen from the Linear algebra, Vector algebra and Analytical geometry sections. The other one should be chosen from the Differential and integral calculus of a function of one variable. The final mark is formed after a talk with the student.

SB15447 Programming

ECTS credits: 9
Weekly classes:3l+0s+0lab+3pr+ca
Assessment: Exam
Type of exam: written
Responsible department:
Informatics and Information Technologies
Faculty of Natural Sciences and Education
Lecturers:
Prof. Tzvetomir Vassilev, MEng, PhD, Dept. of Informatics and Information Technologies, tel. 888 475,
Email: tvassilev@uni-ruse.bg
Summary:
The course is an introduction to programming and aims at acquiring skills to develop algorithms and computer programs with intermediate difficulty. Significant attention is paid to developing algorithms, as the skill to create algorithms is very important in order to develop effective programs. The C++ programming language is studied, which is widely spread and used in later courses.
Syllabus Contents:
Principle of program control, computer components, data representation. Developing programs. Algorithms. Boolean algebra. Introduction to C++ programming language. Operations, expression. Assignment statement. Data input and output. IF and switch statements. Repetition. Arrays, pointers. Functions. Strings. Structures. Files. Classes and objects.
Teaching and Learning Methods:
The lectures clarify the theoretic aspect of the topics and have a sufficient number of examples. This enables the students to prepare in advance for the workshops and to work independently during the classes.
The workshops are held in computer labs. The students do practical work developing, testing and debugging C programs.
The exam is written. It comprises problems that require developing a program and a commenting on existing programs. The problems have several items with an increasing level of difficulty.

S00257 Physics

ECTS credits: 4
Weekly classes: 2l + 0s + 0lab+ 1pr
Assessment: Exam
Type of exam: written, test
Departments involved:
Department of MMEEG and Physics
Faculty of Transport
Lecturers:
Assoc. Prof. Petko Hristov Mashkov, MEng, PhD, Dept. of MMEEG and Physics, tel: 082888583
E-mail: pmashkov@uni-ruse.bg
Abstract:
The course aim is to introduce students to the physical character of processes and phenomena in nature and the methods of their investigation, with the most general properties of the matter and material objects. The laboratory exercises aim at creating skills for experimental investigation of physical phenomena.
Course content:
Measuring physical quantities. Mechanics of material point. Work and energy. Laws of conservation in mechanics. Oscillations & waves. Acoustics. Molecular physics and thermodynamics. Electric field and electric current. Magnetic field and magnetic forces. Electromagnetic field. Wave, geometric & quantum optics. Elements of Semiconductor physics and of Atomic & Nuclear physics.
Teaching and assessment:
Lectures give the main theoretical material, supported by some experimental and multimedia demonstrations of physical phenomena and processes. At the laboratory sessions the students work experimentally and investigate particular physical phenomena. Student knowledge of the theoretical material is tested regularly. The exam is in a form of test. The end mark depends on the results of the test and of the laboratory sessions.

SB15484 Electrical Engineering and Electronics

ECTS credits: 6
Weekly classes: 2l+0s+0lab+2pr+1ca
Assessment: Exam
Type of exam: written
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Boris Ivanov Evstatiev, MEng, PhD, DSc, Department of Automatics and Electronics, tel.: +359 82 888 371;
E-mail: bevstatiev@uni-ruse.bg
Abstract:
The course Theoretical electrical engineering introduces students with the basics of electrical circuits and methods for transfer of electromagnetic energy and information.
The acquired knowledge is a basis for all electrical engineering courses.
Course content:
Basic quantities in electrical engineering; steady state in DC linear and nonlinear circuits; transient processes in linear DC circuits; sinusoidal steady state; nonsinusoidal steady state and filters; transmission lines; nonlinear elements in AC circuits.
Teaching and assessment:
Lectures present the teaching material according to the syllabus. During the labs the students perform their work in groups and prepare an individual report. At the middle of the semester each group receives a course assignment which should be solved and delivered by the end of the semester. The course mark is formed from the reports (10%), the course assignment (25%) and the exam (65%).

SB15448 3D Technologies

ECTS credits: 4 **Weekly workload:** 2l+0s+0lab+2pr
Assessment: Continuous assessment **Type of exam:** written
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Valentinov Hristov, MEng, PhD; Department of Telecommunications; tel.: (+359 82) 888 663;
E-mail: ghristov@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, MEng, PhD; Department of Telecommunications;
tel.: (+359 82) 888 353; E-mail: dkyuchukova@uni-ruse.bg
Abstract:
3D Technologies is to familiarize students with the modern methods for creating 3D models and their application in different areas. The 3D technologies are becoming widely spread in different areas – education, industry, entertainment, advertisement and others. This will give the students who pass the course and acquire the basic knowledge the ability to find professional realization in wider area.
Course content:
The expected results are for students to acquire the necessary knowledge and skills to work with modern technologies for 3D scanning, modelling, animation, 3D printing and building application with augmented and virtual reality. Students will acquire advanced and in-depth theoretical and practical knowledge for creation of three-dimensional computer models – photogrammetry, triangulation, 3D scanning. They will get acquainted with the various technologies for 3D printing and will have the necessary knowledge to create various applications, computer games and animations. After completing the course, students will be able to apply the basic techniques for reconstruction and creation of three-dimensional computer models. They will acquire skills for digitalization of objects through photogrammetry and 3D scanning. They will learn how to create augmented and virtual reality applications and will be able to create photorealistic scenes by properly rendering the objects in the scenes. In addition, they will be able to perform prepress and be able to create real copies of objects by using 3D printers.
Teaching and assessment:
The course includes 2 weekly hours of lectures and 2 hours of workshops. The workshops are held in a computer lab equipped with 3D scanners, 3D printers, cameras, workstations with software for 3D reconstruction, modelling and rendering.

S00321 Technical English 1

ECTS credits: 3 **Weekly workload:** 0l+0s+0lab+3pr
Assessment: Continuous assessment **Type of exam:** written, oral
Department involved:
Department of Foreign Languages
Faculty of Mechanical & Manufacturing Engineering
Lecturers:
Snr Lecturer Mariela Risova, Dept. of Foreign Languages, tel.: +359 82 888 816; E-mail: mrisova@uni-ruse.bg
Snr Lecturer Diana Stefanova, Dept of Foreign Languages, tel.: +359 82 888 230;
E-mail: dstefanova@uni-ruse.bg
Snr Lecturer Elitsa Georgieva, Dept. of Foreign Languages, tel.: +359 82 888 230;
E-mail: edgeorgieva@uni-ruse.bg
Abstract:
‘Technical English 1' comprises 45 hours of classroom work and develops skills for oral and written communication in the foreign language in the students' professional field of study. New vocabulary connected to the basic terminology of the specialized subjects is acquired. General topics related to the field of informatics and computer science are considered. Skills to elicit essential information from a text and to write a summary are developed. Students are expected to prepare and give a short presentation on a chosen topic related to computing or IT. A prerequisite for 'English Part 1' is an intensive English course taken in secondary school.
Course content:
Living in the digital age. Semiconductors. The main parts of the PC. Peripherals. Storage devices. Portable computers. Smartphones. Operating systems. Office suites. Special purpose applications. Computer-integrated manufacturing. Cloud technologies. Programming languages. Writing a computer program.
Teaching and assessment:
The practical exercises include the following components: introducing new information; summary and revision; presenting and analysing individually accomplished tasks; knowledge reinforcement through diverse exercises - role-play, work on authentic texts and in a computer room. Students are given two written tests during the semester.
The requirements for obtaining a semester validation are regular attendance, completing assigned tasks, giving a presentation and doing the tests. The final mark is based on continuous assessment.

S00419 English 1

ECTS credits: 3
Weekly workload: 0l+0s+0lab+3pr
Assessment: Continuous assessment
Type of exam: written and oral
Department involved:
Department of Foreign Languages
Faculty of Mechanical Engineering
Lecturers:
Sr. Lecturer Mariela Risova, Dep. of Foreign Languages, tel: 082 888816; E-mail: mrisova@uni-ruse.bg
Abstract:
The subject English Part 1 for the degree course Information and Communication Technologies comprises 45 hours of classroom work and provides basic skills for oral and written communication in the foreign language in view of the students' field of study. New vocabulary connected with the basic terminology of the specialized subjects is acquired. General topics related to the field of informatics and computer science are considered. Skills to elicit essential information from a text and write a summary are developed. Students are expected to prepare and give a short presentation on a chosen topic related to computing or IT. A prerequisite for 'English Part 1' is an English course taken in secondary school.
Course content:
Education, professions and professional realisation; Computer sciences. Inventions and discoveries; Living in a digital era. Computing and communication systems; Computer essentials. Inside a PC system. Smartphones, laptops, tablets. Steve Jobs presenting the I-Pad. Input devices. Interacting with your computer. Display screens and ergonomics. Magnetic storage. Specifics of technical English grammar and vocabulary.
Teaching and assessment:
The practical exercises include the following components: introducing new information; summary and revision; presenting and analysing individually accomplished tasks; knowledge reinforcement through diverse exercises - role-plays, work on authentic texts and in a computer room. Students are given two written tests during the semester.
The requirements for obtaining a semester validation signature are regular attendance, completing assigned tasks, giving a presentation and doing the tests. The final mark is based on continuous assessment.

S01807 Applied Mathematics

ECTS credits: 5
Weekly classes: 2l + 1s +0lab +1pr
Assessment: Exam
Type of exam: written
Departments involved:
Department of Applied Mathematics and Statistics
Faculty of Natural Sciences and Education
Lecturers:
Prof. Velizar Todorov Pavlov, MSc, PhD, Dept of Numerical Methods and Statistics, tel.:+359 82 888 466,
E-mail: rk-pms@uni-ruse.bg
Assoc. Prof. Stefka Romanova Karakoleva, MSc, PhD, Dept of Numerical Methods and Statistics,
tel.:+359 82 888 606, E-mail: skarakoleva@uni-ruse.bg
Abstract:
The course is a basic one in the mathematical education for electrical engineering. It uses the mathematical knowledge given in Higher Mathematics (Mathematics 1). It is essential for the courses in Applied Mathematics, Physics, Computer Graphics, Discrete structures and modeling, Digital Communicational Canals, Net and Computer Safety, Information and Communications Safety, etc.
Course content:
Laplace transform: basic properties. Functions of two variables: partial derivatives, total differential, Taylor formula and extremum. Numerical solution of linear and nonlinear systems of equations. Methods for approximation of table defined functions, Theory of probability: basic elements. Elements of statistics.
Teaching and assessment:
Initial testing on 10 problems is performed. Two control works are included. The final mark takes them into account and it is well defined in the program. This mark could be formed before the session time.

S00327 Pulse and Digital Devices

ECTS credits: 6 **Weekly workload:** 2l+0s+0lab+2p+1,0ca
Assessment: Exam **Type of exam**: written test
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, MEng, PhD; Dept. of Telecommunications; tel.: (+359 82) 888 823; E-mail: nina@uni-ruse.bg
Assoc. Prof. Adriana Naydenova Borodzhieva, MEng, PhD; Dept. of Telecommunications; tel.: (+359 82) 888 734; E-mail: aborodzhieva@uni-ruse.bg
Principal Lecturer Ivanka Dimitrova Tsvetkova, MEng, PhD; Dept. of Telecommunications, tel.: (+359 82) 888 836, E-mail: itsvetkova@uni-ruse.bg
Abstract:
The subject has the objective to familiarize students with the main problems of digital electronics. It links the functions of the digital elements with their microelectronic basis on one hand, and on the other hand – with their application when building pulse and digital devices. Deep knowledge in electrical engineering and semiconductors is necessary. The subject helps to give knowledge in the field of hardware.
Course content:
Boolean algebra. Synthesis and analysis of combinational circuits. Digital circuits with memory. Forming circuits. TTL integrated circuits. CMOS logic integrated circuits. Triggers. Schmidt triggers. Multi-vibrators. Impulse circuits with operating amplifiers. Particularities of integrated circuits with middle scale of integration. Interface circuits.
Teaching and assessment:
The lectures give the students the opportunity to get acquainted theoretically with the main questions of digital electronics before the practical exercises. The students must be prepared for each exercise and at the end prepare a report for each of them. The exam is conducted in form of a written test.

S01032 Digital Signal Processing

ECTS credits: 6 **Weekly workload**: 2l+0s+0lab+2p+0,5rep.
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Adriana Naydenova Borodzhieva, MEng, PhD; Dept. of Telecommunications; tel.: (+359 82) 888 734; E-mail: aborodzhieva@uni-ruse.bg
Abstract:
The course aims to acquaint students with the main issues of the theory and practice of digital signal processing. The lecture material focuses on hardware and software for digital signal processing. The practical classes consolidate, expand, and supplement the students' knowledge of modeling and research of the material studied in the lectures, by solving individual assignments and computer simulation.
Course content:
1) Main characteristics of linear, discrete, and time-invariant systems in the time and frequency domains;
2) Basic transformations in digital signal processing – z-transformation, discrete and fast Fourier transforms;
3) Digital filters with a finite and infinite impulse response, digital phase filters, and adaptive filters;
4) Basic operations in digital signal processing – spectral analysis, spectral shift, interpolation, and decimation;
5) Modern applications of digital signal processing, such as audio signal processing and digital speech compression.
Teaching and assessment:
The topics of the lectures give the students the possibility to get acquainted theoretically with the main issues of digital signal processing before doing the practical exercises. The practical exercises are conducted in subgroups. For the topic of the exercise, students are informed in advance and request prior theoretical preparation.

SB17856 Measurements

ECTS credits: 4 **Weekly classes**: 2l+0s+0lab +1pr
Assessment: Continuous assessment **Type of exam**: written test
Methodology management:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Snezhinka Lyubomirova Zaharieva, PhD, Dept. of Automatics and Electronics,
tel.: +359 82 888 382, E-mail: szaharieva@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of Automatics and Electronics, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract
"Measurements" course has the aim to make the students familiar with the basic methods and devices for electrical and non-electrical quantities evaluating as well as the metrical appraisals and results calculating. Another aim is students to acquire skills and habits, which might be needed in measurement schemes realizing, and to solve particular tasks.
The knowledge and skills acquired on this module are needed for the students to perceive the particular modules during the tutorials for metrical design ensuring of the technologic and production processes.
Syllabus contents:
Quantitative analysis and quantitative methods; Identification of a measuring method; Identification of a calculating method; A quality of the quantitative appraisals; Electrical and magnetic quantities; Assigning values to the electrical and magnetic quantities; Electrical quantities measuring by immediate comparison; Electrical quantities by mediate comparison; Digital electro-measuring appliances; Appliances for registration and observation; Electrical quantities calculating; Quantitative analysis of non-electrical quantities by electrical methods and devices; System for ensuring the unity of the measurements.
Technology of teaching:
The process of the education on "Measurements" module consists of lectures and tutorials. Lantern-slides and experimental models might be used as guides.
Normally the tutorials are carried out into cycles. There are four places of work at the hall where on the average three students work together on each of it. The duration of each tutorial is three hours and at the end the students have to prepare a report. During the semester long marking is realized by testing at the time when the tutors are in progress and by periodical test control. The education completes with an exam at the end of second semester. Individual tutorials are carried out regularly at previously announced time for this purpose.

SB15451 Object-oriented programming

ECTS credits: 6 **Weekly workload**: 2l+0s+2pr+1ca
Assessment: Exam **Type of exam**: written and oral
Department involved:
Department of Computer Systems & Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Emilia Georgieva Golemanova, MEng, PhD; Dept. of Computer Systems & Technologies,
tel: 888681, E-mail: egolemanova@ecs.uni-ruse.bg
Principal Assistant Tsvetelina Petrova Kaneva, MEng, PhD; Dept. of Computer Systems & Technologies,
tel: 888681, E-mail: tskaneva@uni-ruse.bg
Abstract:
The course objective is for the students to familiarise themselves and to practically assimilate the methodology of object-oriented programming (OOP) as a basis of many modern languages and systems for developing computer applications. The stress is placed on the practical application of the approach by using universal library functions as well as when developing own functions.
Course content:
Introduction to OOP. Classes and objects – definitions. Constructors and destructors. Data members. Member functions. Overloaded functions. Inheritance. Multiple inheritance. Virtual classes. Virtual functions. Polymorphism. Template class library.
Teaching and assessment:
The lecture topics give the main theoretic aspects of the problems. The workshops and course work classes are conducted in a computer lab. The students have to independently solve, encode and test with the aid of a specific programming environment elements of given problems. Each student is assigned an individual task, which they have to complete by the end of the semester. The final mark is a weighted average of four marks: activity during workshops, implementation of the individual task, written report and final exam.

S00431 Technical English 2

ECTS credits: 3 **Weekly workload:** 0l+0s+0lab+3pr
Assessment: Continuous assessment **Type of exam:** written, oral
Department involved:
Department of Foreign Languages
Faculty of Mechanical & Manufacturing Engineering
Lecturers:
Snr Lecturer Mariela Risova, Dept. of Foreign Languages, tel.: +359 82 888 816; E-mail: mrisova@uni-ruse.bg
Snr Lecturer Diana Stefanova, Dept of Foreign Languages, tel.: +359 82 888 230;
E-mail: dstefanova@uni-ruse.bg
Snr Lecturer Elitsa Georgieva, Dept. of Foreign Languages, tel.: +359 82 888 230;
E-mail: edgeorgieva@uni-ruse.bg
Abstract:
'Technical English 2' upgrades the foreign language competence of the students in working with specialized literature and in professional communication. The practice is aimed at achieving greater precision in the use of typical and common phrases, structures and lexical and grammatical patterns. Authentic technical texts are mostly used so that students are acquainted with scientific style. The specialized topics are specifically selected to stimulate activity in the discussions. An individual or team presentation is to be prepared and given on topics related to well-known IT companies or leading experts.
Course content:
Ethernet and computer networks. Optical fibres. Web browsers. WWW and Internet. Email. Blog or website. Telecommunication satellites. Internet safety. Computer graphics and web design. Digital television. Technologies for processing audio and video. Videogames. E-learning. Careers in the computer field. Moore's law and the future of computers.
Teaching and assessment:
The practical exercises include the following components: introducing new information; summary and revision; presenting and analysing individually accomplished tasks; knowledge reinforcement through diverse exercises - role-play, work on authentic texts and in a computer room. Students are given two written tests during the semester.
The requirements for obtaining a semester validation are regular attendance, completing assigned tasks, giving a presentation and doing the tests. The final mark is based on continuous assessment.

S00427 English 2

ECTS credits: 3 **Weekly workload**: 0l+0s+0lab+3pr
Assessment: Continuous assessment **Type of exam**: written and oral
Department involved:
Department of Foreign Languages
Faculty Mechanical Engineering
Lecturers:
Sr. Lecturer Mariela Risova, Dep. of Foreign Languages, tel: 082 888816; E-mail: mrisova@uni-ruse.bg
Abstract:
The subject English Part 2 for the degree course Information and Communication Technologies comprises 45 hours of classroom work and it extends the foreign language competence of the students to cope with specialised literature and professional communication. Work is done to achieve a greater accuracy in the use of typical and common phrases, structures and grammatical models. Authentic texts are widely used to bring the learners closer to the scientific style. Collocations with frequently used terms and notions are considered. Students prepare and give team presentations.
Course content:
Computer Networks; Cybercrimes; Computers in education; Word processing; Multimedia; Characteristics of the technical text; Job interview; New technologies and Trends in development; History of BBC.
Teaching and assessment:
The practical exercises include the following components: introducing new information; summary and revision; presenting and analysing individually accomplished tasks; knowledge reinforcement through diverse exercises - role-plays, work on authentic texts and in a computer room. Students do two written tests during the semester.
The requirements for obtaining a semester validation signature are regular attendance, completing assigned tasks, participating in a team presentation and doing the tests. The final mark is based on continuous assessment.

S01567 Data Transmission and Computer Communications

ECTS credits: 5 **Weekly workload**: 2l+0s+0lab+1pr+1,0ca
Assessment: Continuous assessment **Type of exam**: written
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Teodor Bozhidarov Iliev, MEng, PhD, Dept. of Telecommunication, tel.: (+359 82) 888 839,
E-mail: tiliev@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, PhD, MEng; Department of Telecommunications,
tel.: (+359 82) 888 353, E-mail: dkyuchukova@uni-ruse.bg
Principal Assistant Georgi Dimitrov Georgiev, MEng; Dept. of Telecommunications; tel.: (+359 82) 888 353;
E-mail: gdgeorgiev@uni-ruse.bg
Abstract:
This course focuses on the transport of multi-media information among distributed computer systems. We examine how modern communication protocols, as implemented in the Internet, satisfy the differing requirements of the services that generate and use multi-media information.
Course content:
The course contains: OSI history, TCP/IP architecture, Digital Communication, Multiplexing, Successfully Allocating Resources, Encoding Application Data, Securing the Data.
Teaching and assessment:
The lectures clarify the theoretic aspect of the topics and have a sufficient number of examples. This enables the students to prepare in advance for the workshops and to work independently during the classes.
The workshops are held in computer labs. The students do practical work developing, testing and debugging computer networks.

S01609 Computer Organization

ECTS credits: 6 **Weekly classes:** 2l+0s+0lab+2pr+ca
Assessment: Exam **Type of exam:** written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Aneliya Stoyanova Ivanova, MEng, PhD, Department of CST, tel.: 888 827,
E-mail: AIvanova@ecs.uni-ruse.bg
Principal Assistant Orlin Asenov Tomov, MEng, PhD, Dept. of CST, tel.: +359 82 888 276;
E-mail: OTomov@ecs.uni-ruse.bg
Abstract:
The objective of the Computer organization course is to familiarize the students with the arithmetic and algorithmic fundamentals of computer circuitry and most of all - with the structure and way of operation of the CPU. The following topics are considered in details: structure and way of operation of Arithmetic and Logic Unit, Control Unit, registers, stack, cache, RAM, interrupt system. The organization of computational process is considered, too. Special attention is paid to the computer peripherals – the input and output devices and data storage devices are discussed. The fundamentals of control, diagnostics and reliability of the computer are also introduced to the students.
Course content:
Arithmetic basis – counting systems, arithmetic computations, presentation and coding of numerical, symbolic and logical data. CPU - definition, classification, main components. Structure of the arithmetic and logic unit. Structure of the control unit. Memory structure – registers, stack, cache, RAM. Structure of an interrupt system. Organization of computational process. Computer peripherals. Basic methods and tools for increasing the reliability of the computer.
Teaching and assessment:
At the lectures the students are familiarized in a theoretical aspect with the methods and algorithms for execution of various operations in computer. At the workshops, the structure and way of operation of different CPU units and operational blocks are discussed and the students explore the discussed algorithms using interactive software simulators of the basic CPU units and operational blocks. The students take the role of the control unit and set the necessary control signals by clicking the corresponding buttons. During the lectures and workshops the learning content is delivered using modern presentation systems with interactive whiteboards. The course assignment is developed in the virtual laboratory on Computer Organization. The learning process is supported by a WEB based course on Computer Organization in the e-learning platform of the University and by a closed Facebook group, where a lot of video clips on the course subject are published.

S01672 Discrete Structures and Modelling

ECTS credits: 5 **Weekly classes:** 2l+0s+0labs+2pr+0ca
Assessment: Continuous assessment **Type of exam:** written
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Irena Marinova Valova, MEng, PhD; Dept. of Computer Systems and Technologies;
tel.: +359 82 888 685, e-mail: ivalova@ecs.uni-ruse.bg
Assoc. Prof. Adriana Naydenova Borodzhieva, MEng, PhD; Dept. of Telecommunications;
tel.: 082 888 734; E-mail: aborodzhieva@uni-ruse.bg
Annotation:
The aim of the course is to introduce students from the speciality "Information and Communication Technologies" in discrete modelling by problem solving and programming for analysis and synthesis of engineering objects.
Course content:
General information about discrete modelling. Modelling with graphs, Petri nets, pattern recognition, continuous-time and discrete-time Markov chains, and queuing systems.
Training technology:
The conceptual training in the course is carried out through lectures, and the practical – through exercises. During the lectures, students are introduced to the relevant sections of discrete mathematics, information structures and modelling technology with the appropriate mathematical apparatus. During the exercises, students get the opportunity to apply in practice this knowledge to solve specific practical tasks.
Each student receives an average grade from the exercises as a result of short tests, prepared and conducted on the material of each of the five main topics and his/her work during the exercises. During the semester 5 control works (tests) are carried out on one wide-spreading task from each section. The final grade for the course is formed as an arithmetic mean of the grade from the practical classes and the grade from the tests, provided that each of them is higher than 2.

S00345 Synthesis and Analysis of Algorithms

ECTS credits: 6 **Weekly classes**: 2l+0s+0lab+2pr
Assessment: Exam **Type of exam**: written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Tsvetozar Stefanov Georgiev, MEng, PhD, Dept. of CST, tel: 888827, 888711,
E-mail: TGeorgiev@ecs.uni-ruse.bg
Assoc. Prof. Emilia Georgieva Golemanova, MEng, PhD, Dept. of CST, tel: 888681,
E-mail: EGolemanova@ecs.uni-ruse.bg
Abstract:
The aim of the subject is to provide students with fundamental knowledge about the theory of algorithms. The students will learn the main algorithms for dynamic data structures processing. The students will be familiarized with the notations as recursion, iteration and asymptotic analysis.
Course content:
Dynamic memory, pointers, dynamic variables. Iteration and recursion. Main data structures – lists, queues, stack, deques, trees and graphs. Algorithms for linear and non-linear data structures processing. Hashing and hash-tables. Asymptotic analysis of algorithms.
Teaching and assessment:
The lectures give the necessary theoretical information about synthesis and analysis of algorithms. The students have specific algorithms to implement on each workshop. The assessment is provided as written and oral exam. The written exam includes theoretical and practical parts. The final mark is formed of two marks: mark during workshops (weight 40%) and mark from the final exam (weight 60%).

S01680 Computer Graphics

ECTS credits: 4 **Weekly workload**: 1l+0s+0lab+2pr+1.0rep
Assessment: Continuous assessment **Type of exam**: written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Svetlana Petrova Stefanova, MEng, PhD, Dept. of CST, tel: 082 888 356,
e-mail: SStefanova@ecs.uni-ruse.bg
Principal Assistant Elitsa Silyanova Ibryamova, MEng, Dept. of CST, tel: 082 888 827,
e-mail: EIbryamova@ecs.uni-ruse.bg
Principal Assistant Lachezar Lazarov Yordanov, MEng, Dept. of CST, tel: 082 888 859,
e-mail: LIordanov@ecs.uni-ruse.bg
Abstract:
The objective of the course is to familiarize students with the main definitions in computer graphics and how a graphic system has to be designed. The aim of the course is to build some practical skills for working with vector and raster-oriented graphic editors.
Course content:
Introduction to computer graphics. Computer graphics types and software products for them. Graphic file formats. Color in computer graphics and graphics color models. Input graphical devices. Output graphical devices. Printing technologies.
Teaching and assessment:
Lectures include the main definitions from the computer graphics area. The students have specific tasks to solve in each practice session, using CorelDraw, Photoshop, Pencil 2D and Blender 3D. There are prepared methodological instructions and specific tasks that should be performed during practical exercises. In the course of the semester, the students gradually build a complete graphical project, enhancing it in each practice session. Each student is assigned two individual tasks, which they have to complete by the end of the semester. The final mark is a weighted average of the following marks: a written short exam and implementation of the individual tasks.

S01690 Digital Communication Channels

ECTS credits: 5 **Weekly workload**: 2l+0s+0lab+2pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Teodor Bozhidarov Iliev, MEng, PhD; Dept. of Telecommunication, tel.: (+359 82) 888 839,
E-mail: tiliev@uni-ruse.bg
Abstract:
The course aims to teach the basic principles of digital signal processing, namely: basic parameters of signals and spectrum, channel capacity, signal processing in digital systems, vector representation of signals and noises, signal to noise ratio, channels with determinate parameters and additive noises, linear and block codes, convolutional coding, iterative decoding, multiplexing and multiple access, intersymbol interference, compromises in use of various digital modulations and noise-resistant codes.
Course content:
Information theory. Signal processing in digital systems. Signals and noises in digital systems. Characteristics and models of fading channels. Methods for noise-resistant channel coding. Methods for iterative decoding. Multiplexing and multiple access. Methods for spectrum widening. Digital modulation. Compromises in use of various digital modulations and noise-resistant codes.
Teaching and assessment:
The topics of the lectures give to the students the possibility to get acquainted theoretically with the main issues of the digital signal processing before doing the practical exercises. The practical exercises are conducted in subgroups. For the topic of the exercise, students are informed in advance and request them prior theoretical preparation.

S01814 Microprocessor Systems

ECTS credits: 7 **Workload per week:** 2l+1s+0lab+2pr+1ca
Assessment: Exam **Type of exam:** written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Krastev, MEng, PhD, DSc, Dept. of CST, tel. 888 672, E-mail: gkrastev@ecs.uni-ruse.bg
Principal Assistant Hovanes Avakian, MEng, PhD, Dept. of CST, tel. 888 771,
E-mail: havakian@ecs.uni-ruse.bg
Annotation:
The course “Microprocessor Systems” is compulsory for students of ICT. Its objective is to introduce the students to the field of microprocessors, its logical structure and standard extension math coprocessor. The lectures include topics on signals, registers and stack structures, address modes and instruction set. There are discussed parallel and serial I/O, analogue I/O and timer. The programming model and interrupt system are considered. Elements of assembly language are studied.
Syllabus Contents:
Bus organization of a computer. Main signals and structurec of a processor and coprocessor. Programming model and interrupt system. Elements of assembly language. Addresses and memory. Parallel and serial I/O. Timer. Applications.
Teaching and Learning Methods:
The lectures are two hours, and the lecture material precedes the workshops. The workshops are two hours each and are conducted every week. At the beginning of each workshop students’ knowledge is checked. The course finishes with an examination. The assessment during workshops allows good students to pass the exam earlier.

S01849 Computer Architectures

ECTS credits: 6 **Weekly classes:** 2l+0s+0lab+3pr
Assessment: Exam **Type of exam:** written
Responsible department:
Dept. of Computer Systems and Technologies,
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Nikolay Genkov Kostadinov, MEng, PhD; Dept. of Computer Systems and Technologies,
tel.: +359 82 888 674, E-mail: nkostadinov@ecs.uni-ruse.bg
Summary:
The course addresses architectural aspects of computer systems. Main terms and principles in computer architectures are discussed as well as organization of computations. Modern computer architectures are presented analytically and comparatively. The instructions pipeline and its control is subject of special attention. The three main architectures (accumulator, stack, register) are discussed, as well as x86/IA-32/Intel64 architecture, the DLX architecture of RISC type, memory hierarchy and input-output subsystem structure.
Syllabus Contents:
Computer architecture principles. Historical perspective. Types of computer architectures. Computer system base structure. Principles, laws and equations of computer performance. Organization of the computations. Accumulator, stack and register architecture. Architecture x86/IA-32/Intel64. Working modes. RISC architecture DLX. Instruction level parallelism. Computer memory hierarchy. Input-output system.
Teaching and Learning Methods:
The lectures introduce main theoretical topics. Each group of lectures ends with conclusion of material and formulation of problems.
At the workshops simulations and real systems are used putting lectures to practice. Each workshop begins with formulation and analysis of problems. At the very end students are asked to summarize in written form their results.
The information materials needed are given in electronic form to all students.

S01895 Software Engineering

ECTS credits: 5 **Weekly workload:** 2l+0s+0l+2pr
Assessment: Exam **Type of exam:** written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Galina Ivanova Ivanova, PhD, Dept. of CST, tel.: 888 855, E-mail: giivanova@uni-ruse.bg
Principal Assistant Pavel Stoyanov Zlatarov, PhD, MEng, Dept. of CST, E-mail: pzlatarov@uni-ruse.bg
Abstract:
The objective of the Software Engineering course is to familiarize the students with the theoretical and practical aspects of the basic approaches of software design, development, testing and software project documentation.
The course has input links with the following courses: Programming, Synthesis and Analysis of Algorithms, Object Oriented Programming.
It has output links with System Programming, Web Programming, and Programming Languages.
Course content:
Contemporary software development paradigms - Agile methodologies. Software process models. Project management. Software design. User interface design. Software project development. Quality control and assurance. Refactoring. Software application testing. Software project documentation.
Teaching and assessment:
Lectures introduce students to basic theoretical aspects of the software engineering process. Practical sessions provide students with an opportunity to explore the software development process in practice. An examination concludes the course. During the semester, continuous assessment is carried out during classes. If students work systematically and achieve satisfactory results, they can be exempt from the examination.

S01970 Databases

ECTS credits: 6 **Weekly classes:** 2l+0s+2pr
Assessment: Exam **Type of exam:** written and oral
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Irena Valova, MEng, PhD, Dept. of Computer Systems and Technologies
tel.: +359 (0)82 888685, e-mail: ivalova@ecs.uni-ruse.bg,
Principal Assistant Tsvetelina Petrova Kaneva, MEng, PhD, Dept. of Computer Systems and Technologies
tel.: +359 (0)82 888681, e-mail: tskaneva@uni-ruse.bg
Abstract:
The objective of Databases (DB) course is that the students are acquainted with the database theory and practice, including organization, design, representation, implementation and usage of relational databases. This includes acquiring knowledge of modern technological tools and relevant programming languages for database development and maintenance that are created by leading corporations in this field.
Syllabus contents:
Basic data models. Entity-Relationship model. Relational data model. Converting Entity-Relationship diagrams to relational database schemas. Relational algebra. Anomalies on relations. Normal forms. The new technological tools and relevant programming languages, designed for database development and maintenance. Structured Query Language (SQL). Data Definition language. Data Manipulation Language. Data Query Language. Operators for Grouping and Aggregation of data. Views. NoSQL databases.
Teaching and learning methods:
During the lectures, students are introduced to the theoretical foundations of DB and database structured query language (SQL). The workshops are conducted in a computer lab equipped with modern computers, connected to the Internet. During the practical exercises students learn the theoretical foundations of DB by using web-based interactive learning tools for visualization and interpretation of methods for design, implementation and use of databases. Moreover, students acquire skills and habits to independently create databases and programs for their management. The course ends with an exam. The final grade on course is formed as an average of marks on the practical tasks in the exam and discussions after this, and also current assessment obtained during the semester is taken into account.

S01982 Web Design

ECTS credits: 5 **Weekly classes:** 2l+0s+2pr+1ca
Assessment: Continuous assessment **Type of exam**: written
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Georgi Todorov Georgiev, MEng, PhD; Dept. of Computer Systems and Technologies;
tel.: +359 (0)82 888744; e-mail: gtgeorgiev@ecs.uni-ruse.bg
Abstract:
The course objective is to familiarize the students with the underlying client-side technologies for creating a Web site, to create awareness of W3C standards, to promote good practices for achieving Web content accessibility, usability and credibility.
Syllabus contents:
A short history of Internet. Basic services and WWW. HTML. The need for stricter standards - from HTML to XHTML to HTML5. Separating the document structure from the presentation - CSS. CSS positioning, responsive design. Client-side programming - the ECMAScript / JavaScript language. The Document Object Model (DOM). New features in HTML5. Introduction to HTTP and its usage via ajax. Fundamental design goals of a Web site - accessibility, usability and credibility. Introduction to Search engine optimization (SEO).
Teaching and learning methods:
Lectures are given as multimedia presentations. The workshops are problem-oriented; the students have specific tasks to solve in each workshop, using a simple text editor or Web content creation IDE. In the course of the semester, the students gradually build a complete site, enhancing it in each workshop session. Each student is assigned an individual task, which they have to complete by the end of the semester. The final mark is a weighted average of three marks: activity during workshops, a mid-term test and a final test.

S01984 Project 1

ECTS credits: 2 **Weekly classes**: 0l+0s+0lab+0pr+3cp
Assessment: defence **Type of exam**: written and oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Irena Marinova Valova, MEng, PhD, Dept. of CST, tel.: +359 82 888 685;
E-mail: Irena@ecs.uni-ruse.bg
Abstract:
The course objective is to consolidate the acquired theoretical and practical knowledge in the third semester by working on a given topic from this material. Also, students acquire skills for documenting and presenting their work.
The course is related to the courses "Programming", "Synthesis and Analysis of Algorithms", "Discrete Structures and Modeling" and "Object Oriented Programming" weak parallel connections with "Software Engineering" and "Databases" and output connections with "Artificial Intelligence" and the diploma project .
Course content:
The course covers theoretical and practical material on basic topics in discrete structures - sets, graphs, Petri nets, Markov chains, queuing systems, and pattern recognition.
Teaching and assesment:
Each student received his own individual task. He has to prepare a report on the theoretical aspects, the main applications of the theoretical tasks and algorithms. Also he has to describe in details at least one of the algorithms and to implement it in selected programming language. At the end he has to prepare a presentation of the theoretical and practical part of the project. The final mark is the average from the estimates of the report, the practical realization and presentation.

S02554 Practical Training 1

ECTS credits: 3 **Weekly workload**: 3 weeks, 90 hours
Assessment: Colloquium **Type of exam**: written and oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Lachezar Lazarov Yordanov, MEng, PhD, Dept. of CST, tel.: +359 82 888 859;
E-mail: LIordanov@ecs.uni-ruse.bg
Abstract:
The purpose of the discipline “Specializing Practice – I” is to introduce the students from the specialty “Information and Communication Technologies” to the environment of a real working factory or organization, which is working in the sphere of designing, integrating, manufacturing, running and/or support of the latest computer and office equipment, networks, and informational systems. It takes place in the fourth semester, right after the summer exams.
Course content:
Introduction with the production activity of the company or the organization. Standardized regulation of the system, exploitation, working safety measurements, fire safety and pollution safety. Inside order of the company or the organization. Architecture of the computer systems. Application support. Peripherals and their management. Future upgrade and extending of the computer configurations. Support and maintenance of the computer systems. Operating systems. File organization of data. Running test of the applications installed. Evaluating the applications' quality. Systems for managing data bases. Characteristics and parameters of the peripherals. Computer networks. Architectural special features of the network. Technical means of the network. Network operating system. Methods of access.
Teaching and assessment:
The practice takes place in the time specified according to the study schedule. The classes are in well organized and modernly equipped companies, working in the sphere of electronic manufacturing, developing and support of computer and office equipment. The duration of the specializing practice is 15 working days, 6 hours a day, which means 90 hours. The lectures and the practice are in continuous order. In each working place the students are being instructed with the safety requirements and the specific tasks for the classes. Each student gets a personal practical task. The discipline ends with a colloquium.

S01985 Networks and Systems

ECTS credits: 6 **Weekly workload:** 2l+0s+0lab+2pr+1ca
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Valentinov Hristov, MEng, PhD; Dept. of Telecommunications, tel.: +359 82 888 663;
E-mail: ghristov@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, MEng, PhD; Dept. of Telecommunications;
tel.: +359 82 888 353; E-mail: dkyuchukova@uni-ruse.bg
Abstract:
The course objective is to provide the students with working knowledge of the basic tasks, principles and methods used in telecommunication networks, as well as their main areas of application. The lectures include architecture, functionality, interfaces and protocols, which are main part of the modern telecommunication networks. Some of the lectures include information about the newest technologies used for data transmission.
In addition a number of practical problems are discussed during the lectures. The lectures let the students know about different kind of method and techniques, which solute the above problems.
Course content:
Network Protocols and communications. Hierarchical Network design. Router Architecture. IPv4 addressing and structure of IPv4 addresses. IPv6 protocol – overview, motivation and basic characteristics. Fixed Length Subnet Masking and Variable Length Subnet Masking. IPv4 – IPv6 integration mechanisms. Switching process – basic switch configuration. Virtual Local Area Networks. Static and Dynamic Routing in communication networks. Network security – access control lists. Network Address Translation.
Teaching and assessment:
The topics of the lectures give the possibility to the students to get acquainted theoretically with the main issues of the communication networks. Students have the availability to practice their knowledge during the planed exercises. The department of Telecommunications has equipped laboratories with CISCO devices. During the practice, students create simulated models of communication networks, which are then investigated.

S01990 Specialized Microcomputer Systems

ECTS credits: 6 **Weekly classes**: 2l+0se+0lab+2pr+1ca
Assessment: Exam **Type of exam**: written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Aneliya Stoyanova Ivanova, MEng, PhD, Department of CST, tel.: 888 827,
E-mail: AIvanova@ecs.uni-ruse.bg
Principal Assistant Orlin Asenov Tomov, MEng, PhD, Dept. of CST, tel.: +359 82 888 276;
E-mail: OTomov@ecs.uni-ruse.bg
Abstract:
The aim of the subject is to provide students with fundamental knowledge about one of the most popular family of embedded microcontrollers – MCS51. The students will learn the structure of some of the architecture, some systems for development and their main features and functionalities.
Course content:
Main features of the MCS51 family. Architecture. Memory organization. Instruction set. Paralel ports. Serial ports. Displays. Timers/Counters. ADC. PWM. Networks of Microcontrollers.
Teaching and assessment:
The lectures give the necessary theoretical information about the hardware design. The students have specific tasks for software development on each workshop. For this purpose, development boards based on AT89C51AC3 and P80C552 MCUs are provided for each student. At the beginning of each workshop, an evaluation of the students knowledge is performed.
The assessment is provided as written and oral exam. The written exam includes theoretical and practical parts. In the first week the course task topics are given out. Each student develops independently one problem and prepares a written report. The final mark is formed of three marks: mark from the tests during the semester, course task mark and mark from the final exam.

S01991 Artificial intelligence

ECTS credits: 6 **Weekly classes:** 2l+0s+2pr+1ca
Assessment: Exam **Type of exam**: written and oral
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Svetlana Petrova Stefanova, MEng, PhD, Dept. of CST, tel.: +359 82 888 356;
E-mail: SStefanova@ecs.uni-ruse.bg
Assoc. Prof. Emilya Georgieva Golemanova, MEng, PhD, Dept. of CST, tel.: +359 82 888 681;
E-mail: EGolemanova@ecs.uni-ruse.bg
Abstract:
The objective of the course is to familiarize students with the theory of the artificial intelligence systems and to help them acquire the practical skills needed for the design, development and application of such systems. Course prerequisites: Synthesis and Analysis of Algorithms, Discrete Structures and Modeling.
Course content:
Introduction into artificial intelligence. Definition and analysis of problems. Solving problems represented in a state space. Solving problems with a reduction. Knowledge representation.
Teaching and Assessment:
The lecture topics give the main theoretic aspects of the problems. The practical sessions are conducted in a computer lab. The students have to independently solve elements of given problems. The final mark is formed on the basis of the exam, practical session mark, course work mark and results of the tests.

SB15486 Routing and Switching in Communication Networks

ECTS credits: 7 **Weekly workload:** 2l+1s+0lab+2pr
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Valentinov Hristov, MEng, PhD; Dept. of Telecommunications; tel.: +359 82 888 663;
E-mail: ghristov@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, MEng, PhD; Dept. of Telecommunications;
tel.: +359 82 888 353; E-mail: dkyuchukova@uni-ruse.bg
Abstract:
The goal of the course is to familiarizing students with the specifics and features of routing protocols used in IP-based networks. Lectures cover the reason for the complexity of routing algorithms - coordination between the different units in the network, overload of communication channels, etc. The lectures also include interior routing protocols (within Autonomous system) and exterior routing protocol (between Autonomous systems). In addition a number of practical problems are discussed during the lectures. The lectures let the students know about different kind of method and techniques, which solute the above problems.
Course content:
Switching Process in IP networks. Virtual Local Area Networks. VLAN trunking protocol. Spanning Tree Protocol. Inter VLAN routing. Routing data and packet forwarding. Graph Theory. Dijkstra's algorithm – shortest path calculation. Bellman–Ford algorithm – shortest path calculation. Routing Table theory. Static and Dynamic routing. Interior Routing Protocols. Exterior Routing Protocols.
Teaching and assessment:
The topics of the lectures give the possibility to the students to get acquainted theoretically with the main issues of the communication networks. Students have the availability to practice their knowledge during the planed exercises. The department of Telecommunications has equipped laboratories with CISCO devices. During the practice, students create simulated models of communication networks, which are then investigated.

SB16336 Management

ECTS credits: 3 **Weekly workload:** 2l+1s+0lab+0pr
Assessment: Continuous assessment **Type of exam**: written
Departments involved:
Department of Department of Management and Business Development.
Faculty of Business and Management.
Lecture:
Assoc. Prof. Svilena Ruskova, PhD, Dept. of Management and Business Development, tel.: +359 82 888 617
E-mail: sruskova@uni-ruse.bg
Abstract:
The course aims to provide students with some basic managerial skills and expertise. The teaching material is designed in accordance with the students' aspirations of getting theoretical knowledge in the field of management. Theories and methods for planning, organizing, leading, and management control are introduced in the course. Students acquire practical approach to decision making. They analyze and review case studies to develop practical skills for their future career. The course is linked to the Personal and professional development.
Course content:
The course includes the following topics: Development of Management – theory and practice;
Organizational concept; Management system; Management effects and Subject of management.
Teaching and Assessment:
In the teaching course besides the classical lecture methods it is planned to use also visualizing aids. The bigger part of the taught material is being illustrated by appropriate examples from practice. This assists the efforts for implementing more purposeful seminars.
The seminars are synchronized with the lectures. Students are expected to do their lecture readings beforehand, so that they will be able to participate in class discussions more adequately. The assistant Prof. carries out a continuous assessment and gives an average evaluation for the term, based on the overall student's participation in the discussions and in the debates on causes. Along with the examination of the level of acquired professional knowledge on Management, the skills for applying them in practical situations are also being viewed. The overall evaluation is built on the base of the participation assessment during the term and the writing test.

S01999 Course Project 2 at Routing and Switching in Communication Networks

ECTS credits: 2
Weekly workload: 0l+0s+0lab+0pr+3cp
Assessment: defence
Type of exam: written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Valentinov Hristov, MEng, PhD; Dept. of Telecommunications; tel.: +359 82 888 663;
E-mail: ghristov@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, MEng, PhD; Dept. of Telecommunications;
tel.: +359 82 888 353; E-mail: dkyuchukova@uni-ruse.bg
Abstract:
The Course Project at Routing and Switching in communication networks is included as mandatory in the curriculum of specialty Information and Communication Technologies students of III year. Students consolidate knowledge on Communication networks and systems and Routing and switching in communication networks and develop skills to independently solve engineering task for the design and maintenance of the telecommunications network.
Course content:
Design of telecommunication network and implement static routing
Design of telecommunication network and implement dynamic routing
LAN Design. Segment LAN into virtual local area networks.
Design of telecommunication network for IPv4 – IPv6 coexistence.
Design of telecommunication network with improve network security. Implement Access Control Lists.
Teaching and assessment:
Each student receives an individual assignment and methodological instructions for developing a course project at Routing and Switching. In the course of the semester individual consultations are provided weekly and systematic monitoring of the project work is executed. The semester certification determines that the minimum technical requirements are met and the student has worked on the project systematically. When it is ready, the project is defended.

S02000 Networks Protocols

ECTS credits: 6
Weekly workload: 2l+0s+0lab+2pr+0,5rep
Assessment: Exam
Type of exam: written
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Valentinov Hristov, MEng, PhD; Dept. of Telecommunications; tel.: +359 82 888 663;
E-mail: ghristov@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, MEng, PhD; Dept. of Telecommunications;
tel.: +359 82 888 353; E-mail: dkyuchukova@uni-ruse.bg
Abstract:
The network statements, viewed, allow the students receive knowledge and skills of most frequently used high level protocols and services, establishing server and client software for these protocols.
Prerequisites for this course are the courses in Data and Computer Communication.
The knowledge and experience gained in this course may be useful for the BSc thesis.
Course content:
The network statements, viewed, allow the students receive knowledge and skills of most frequently used high level protocols and services, establishing server and client software for these protocols.
Teaching and assessment:
The course includes 2 weekly hours of lectures and 2 hours of workshops. The workshops are held in a computer lab with PCs running Microsoft Windows.

S02003 Digital Television Systems

ECTS credits: 6 **Weekly workload**: 2l+0s+0lab+2pr+1ca
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Teodor Bozhidarov Iliev, MEng, PhD; Dept. of Telecommunication; tel.: +359 82 888 839;
E-mail: tiliev@uni-ruse.bg
Abstract:
The subject Digital television systems has the objective to acquaint the students with the characteristics and principle of analog to digital conversion of audio and video signals, technologies and specifications for source and channel coding. In the second part of the subject attention is paid to the digital modulation methods (PSK, QAM, OFDM and 8VSB), most common standards for the digital coding of audio and video signals (MPEG-2, H.264). The digital video broadcasting methods like DVB-T, DVB-C, DVB-S, DVB-H.
Course content:
Principle of analog to digital conversion of component video signal. Digital television with High Definition (HDTV). Digital television with Standard Definition (SDTV). Methods for video compression by standards MPEG-1/2/4 and H.261/3/4. Transnission of digital television signals. Digital modulations. Principles of digital television broadcasting. Digital television broadcasting. Architectures of systems for multimedia information distribution. Reception of digital television signals. Costumer devices and additional services.
Teaching and assessment:
The topics of the lectures give the possibility to the students to get acquainted theoretically with the main issues of the digital television techniques before doing the practical exercises. Students investigate the main characteristic of the digital television signal (BER, MER, carrier/noise, Wrong packets) at different standards, using the available laboratory installations and measure instruments. Lectures discuss mainly the principles of digital television, while the practical exercises pay attention to the main characteristics of digital television signals.

S02004 Information Systems

ECTS credits: : 5 **Weekly classes:** 2l+0s+2pr
Assessment: Exam **Type of exam: written and oral**
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Tsanko Dimitrov Golemanov, MEng, PhD, Dept. of CST, tel.: +359 82 888 681,
E-mail: TGolemanov@ecs.uni-ruse.bg
Abstract:
The course "Information Systems" aims to acquaint students with the systems approach and the role of information systems in different organizations structures of the society. The basic concepts and principles related to information systems, the architecture and components of the systems are discussed. Particular attention is paid to the stages in the development of specific information system, starting with an analysis of the problems giving rise to the need for this system and reaching to its physical realization. In addition, the problems associated with scheduling, management of projects and analysis of revenues, costs and return on investment will be considered .
Course content:
Systems - basic concepts, definition of system. Organizations as systems. Organizations management . Information systems - definition, model and components of the information system. Requirements to information systems at different levels of management. Data and information. Characteristics of useful information. Types of information systems. Development of information systems. Life cycle of a system. Main phases of development of information systems - Phase 1: Feasibility Study, Phase 2: Systems Analysis - Data acquisition, preparation of system specification, Phase 3: Systems design - Design of the output. Design of the input, Project Management - scheduling, network schedules. Analysis of the cost-benefit, return on the investment analysis.
Teaching and Assessment:
Lectures are held once per week - 2 hours. The lectures address basic theoretical issues related to information systems. Each group of lectures ends with a summary of material and formulation of problems. Practice exercises per week - 2 hours. They are focused on the design and development of a complete information system within a modern RAD-environment. Students work in teams of 2-3 persons. Each exercise begins with a formulation and analysis of problems, and using the resources of the RAD-environment teams have to work out an adequate solution. The course ends with an exam. The final grade on course is formed as an average of marks on the theoretical questions and practical tasks in the exam, and current assessment obtained during the semester is taken into account.

S02007 Digital Signal Processors

ECTS credits: 6 **Weekly workload:** 2le+0s+0lab+2pr+1ca
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, MEng, PhD; Dept. of Telecommunications; tel.: +359 82 888 823;
E-mail: nina@uni-ruse.bg
Abstract:
The subject Digital Signal Processors has the objective to familiarize the students of the “Information and Communication Technologies” degree course with the architecture of digital signal processors (DSP) as well as with integrated development environments for simplify DSP system configuration and application design. The subject Digital Signal Processors is related to the subjects “Impulse and Digital Devices”, “Digital Signal Processing”, “Microprocessor systems”, “Computer Architecture” and to the diploma project.
Course content:
Key features of the TMS320C54X DSP family. DSP architecture. Bus structure. Central Processing Unit. Memory organization. Data addressing. Program memory addressing. Pipelining. On-Chip Peripherals. Serial ports. DSP applications. DSP chip programming and design of digital filters, analog-to-digital and digital-to-analog conversions, and pulse-wide-modulation.
Teaching and assessment:
The lectures mainly concentrate on the hardware, while the emphasis of the practical exercises is on the development of software for microprocessor systems based on DSP. The practical works are carried out in a computer laboratory equipped with specialized demonstration boards and a DSP developing environment based on PC. At the beginning of each laboratory exercise an entrance test is conducted to check the students’ preparation. At the beginning of the term each student is given an individual assignment. It has to be presented and defended orally at the end of term. The final mark is based on the results of the exam and course assignment.

S02008 Programming Languages

ECTS credits: 5 **Weekly classes:** 2l+0s+0lab+2pr
Assessment: Continuous assessment **Type of exam:** written and oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Georgi Todorov Georgiev, MEng, PhD, Dept. of CST, tel.: +359 82 888 744;
E-mail: gtgeorgiev@ecs.uni-ruse.bg
Abstract:
The aims of this course are to generalize the students' knowledge on programming languages; to give them a more in-depth view of fundamental underlying principles and ultimately to facilitate the process of switching to a new programming language. The course content comprises two parts. In the first one, a new for the students programming language - Java - is introduced, including its use for developing mobile applications. The second part deals with how standard components of high level PLs, such as variables and data types, expressions and operators, subroutines and parameters, are implemented at the machine level. Prerequisites for this course are the courses in Programming, Object-oriented Programming, Software Engineering and Databases. This course is a prerequisite for System Programming, Programming Technologies for the Internet, and the Diploma Project.
Course content:
Programming languages timeline, definitions, taxonomy. Introduction to the Java programming language. OOP in Java. Structured error-handling. GUI and event handling in Java. Input-output in Java. Threads in Java. Data storage containers in Java. Java for mobile applications - Java ME and Android. Low level (machine or Assembler) implementation of variables and data types, expressions and operators, subroutines and parameters.
Teaching and assessment:
The course includes 2 weekly hours of lectures and 2 hours of workshops. The workshops are held in a computer lab with powerful PCs. Two tests are held during the semester. The final mark is based on marks from the two tests, and the work during workshops throughout the semester.

S02011 Project 3

ECTS credits: 2 **Weekly classes**: 0l+0s+0lab+0pr+3cp
Assessment: **Type of exam**:
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Emilya Georgieva Golemanova, MEng, PhD, Dept. of CST, tel.: +359 82 888 681;
E-mail: EGolemanova@ecs.uni-ruse.bg
Principal Assistant Tsanko Dimitrov Golemanov, MEng, PhD, Dept. of CST, tel.: +359 82 888 681,
E-mail: TGolemanov@ecs.uni-ruse.bg
Abstract:
The course objective is to consolidate the acquired theoretical and practical knowledge in the fifth semester by working on a given topic from this material and to improve the skills for documenting and presenting the work done.
The course is related to the courses “Artificial Intelligence", “Specialized Microcomputer Systems" and parallel connections with "Programming Languages" and "Information Systems".
Course content:
The course covers theoretical and practical material on basic topics in Artificial Intelligence (state space search, knowledge representation), as well as recognition and transformation of data formats.
Teaching and assessment:
Each student received his own individual task. He has to prepare a report on the theoretical aspects, the main applications of the theoretical tasks and algorithms. Students have to describe in details the algorithms and to implement them in the chosen programming language. Finally they have to prepare presentations of the theoretical and practical part of the projects. The final mark is based on estimates of the report, the practical realization and presentation.

S02562 Practical Training 2

ECTS credits: 4 **Weekly workload**: 4 weeks, 120 hours
Assessment: Colloquium **Type of exam**: written and oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Lachezar Lazarov Yordanov, MEng, PhD, Dept. of CST, tel.: +359 82 888 859;
E-mail: Llordanov@ecs.uni-ruse.bg
Abstract:
The purpose of the discipline “Specializing Practice – II” is to introduce the students from the specialty “Information and Communication Technologies” to the environment of a real working factory or organization, which is working in the sphere of designing, integrating, manufacturing, running and/or support of the latest computer and office equipment, networks, and informational systems. It takes place in the sixth semester, right after the summer exams.
Course content:
Introduction with the production activity of the company or the organization. Standardized regulation of the system, exploitation, working safety measurements, fire safety and pollution safety. Inside order of the company or the organization. Architecture of the computer systems. Application support. Peripherals and their management. Future upgrade and extending of the computer configurations. Support and maintenance of the computer systems. Operating systems. File organization of data. Running test of the applications installed. Evaluating the applications' quality. Systems for managing data bases. Characteristics and parameters of the peripherals. Computer networks. Architectural special features of the network. Technical means of the network. Network operating system. Methods of access.
Teaching and assessment:
The practice takes place in the time specified according to the study schedule. The classes are in well organized and modernly equipped companies, working in the sphere of electronic manufacturing, developing and support of computer and office equipment. The duration of the specializing practice is 20 working days, 6 hours a day, which means 120 hours. The lectures and the practice are in continuous order. In each working place the students are being instructed with the safety requirements and the specific tasks for the classes. Each student gets a personal practical task. The discipline ends with a colloquium.

S02012 Operating Systems

ECTS credits: 5 **Weekly workload**: 2l+0s+0lab+2pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Tsanko Dimitrov Golemanov, MEng, PhD; Dept. of CST, tel.: +359 82 888 681,
E-mail: tgolemanov@ecs.uni-ruse.bg
Abstract:
The course aims at familiarizing the students with the practical aspects of the organization, structure and use of operating systems (OS). This aim is achieved through a comparative analysis of the main components of three different types of OS – single-user single-tasking, single-user multi-tasking, multi-user multi-tasking.
Course content:
OS classification, definitions.OS progress. OS structure – kernel, user interface, system programs. Processes – definition, life cycle. Concurrent processes.Mutual exclusion.Deadlock.Processor management.Memory management – management methods, virtual memory. File system management. Protection and safety in OS.
Teaching and assessment:
The lecture topics give the main theoretic aspects of the considered problems. The workshops are conducted in a computer lab. In some of the workshops the students study the main commands of the corresponding OS, and in the other workshops simulation programming environments are used to explore and study the OS. The final mark is a weighted average of four marks: activity during workshops and final exam.

S02015 Network Administration

ECTS credits: 6 **Weekly workload:** 2l+0s+0lab+2pr+0,5rep
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Zlatkov Zahariev, MEng, PhD; Dept. of Telecommunications; tel.: +359 82 888 663;
E-mail: pzahariev@uni-ruse.bg
Abstract:
The course in Network administration provides the students with theoretical information on key issues related to the network administration, the use of server operating systems, the processes of installation, configuration and management of the OS. The course develops new and strengthens the already acquired practical skills of the students and develops skills for independent solving of engineering and technical tasks related to the design, modelling and development of specialized local area networks, network clusters with Active Directory, Domain controllers, local data arrays, etc.
Course content:
The course focuses on modern server operating systems and their installation processes, the structure and the function of the active directory and the domain controller, configuration and provision of DHCP and DNS services to the users, the use of group security policies and the use of virtualization technologies.
Teaching and assessment:
The lectures are conducted every week and are preceding the practical exercises. All lectures are presented to the students using multimedia presentations. The exercises are conducted two hours per week in a specialized laboratory and using the necessary specialized equipment.

S03074 System Programming

ECTS credits: 6 **Weekly classes:** 2l+0s+1pr+0,5rep
Assessment: Exam **Type of exam:** written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Georgi Todorov Georgiev, MEng, PhD, Dept. of CST, tel.: +359 82 888 744;
E-mail: gtgeorgiev@ecs.uni-ruse.bg
Prof. Tsvetozar Stefanov Georgiev, MEng, PhD; Dept. of CST, t tel.: +359 82 888 827;
E-mail: TGeorgiev@ecs.uni-ruse.bg
Abstract:
The course objective is to give the necessary theoretic knowledge and practical skills to use the system features of PCs running Windows. Some of the topics covered are: optimizing the operation environment, memory management, multitasking and multithreading. The workshops focus on using the Windows API. The course has input links with the following courses: Programming and Computer Architectures; parallel links with Operating Systems and output links with the Diploma Project.
Course content:
Structure and basic modules of Windows. Optimization of the operation environment, Process and thread management, Interrupt and exception handling system, Operating modes of Intel's x86 processors, Memory management, Video subsystem, Disk subsystem, Other features (BIOS, UEFI, Chipsets),
Teaching and assessment:
The course includes 2 weekly hours of lectures and 1 of workshops. The workshops are held in a computer lab with PCs running Microsoft Windows. Two tests are held during the semester. Besides these, every student must prepare a short presentation. The course ends with a final exam. The final mark is based on marks from the two tests, the presentation, and the final exam.

SB15487 Web Programming

ECTS credits: 5 **Weekly classes:** 2l+0s+2pr+1ca
Assessment: Continuous assessment
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Yordan Kalmukov, MEng, PhD. tel.: +359 (0)82 888 681, JKalmukov@ecs.uni-ruse.bg
Assoc. Prof. Irena Valova, MEng, PhD, tel.: +359 (0)82 888 685, IValova@ecs.uni-ruse.bg
Principal Assistant Tsvetelina Petrova Kaneva, MEng, PhD, Dept. of Computer Systems and Technologies
tel.: +359 (0)82 888681, e-mail: tskaneva@uni-ruse.bg
Abstract:
The course aims to provide students an in-depth theoretical knowledge and practical skills to design and develop web applications and web services.
Course content:
During lectures students learn the basic principles of operation of web services and web applications, their typical architectures and communication protocols. Teaching materials present alternative approaches to design and development scalable, multi-tier, module-organized web applications that provide functional and physical separation of business logic from the user interface and from the data. An attention is paid to all security issues as well, including methods of protecting web applications from an unauthorized access and common hacker attacks. Methods for collecting and storing data from IoT devices, the application of machine learning in web programming, and specific methods for testing web applications are discussed as well.
During the practical exercises students develop a complete web-based information system that provides the most common basic functionalities – user registration and authentication; add, edit and delete data; and etc. The system is implemented as a multi-tier module-organized application in accordance with the MVC architectural pattern. Subsequently, additional functionalities for collecting, storing and analyzing data from IoT devices are also added to it.
Teaching and assessment:
Teaching consists of lectures and practical exercises. An individual coursework is assigned to every student as well. During its defense, at the end of the semester, the tutor formulates an additional functionality that the student should implement alone, onsite and in real time. Student's final grade is based on his/her results from the coursework (90%) and his/her work during the exercises (10%).

S02020 Project 4

ECTS credits: 5 **Weekly workload**: 0l+0s+0pr+3cw
Assessment: defence **Type of exam:** written and oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Elitsa Silyanova Arsova, MEng, PhD, Dept. of CST, tel.: +359 82 888 827;
E-mail: EArsova@ecs.uni-ruse.bg
Abstract:
The aim of the course "Project-4" is students to learn how to apply theoretical and practical knowledge that they have acquired in previous semesters. This objective is achieved by realization of an individual task that includes the design and implementation of software systems with databases. Thereby, students should acquire skills to write the project's documentation and present final product.
Course content:
Formulation and analysis of functional requirements of the designed software system. Database design. Design of the software system's architecture. Design of the software system's logical model. User interface design. Database implementation. Adding test data files in the database. Choice of language and environment for the realization of program modules. User interface implementation by forms and software modules. Program modules realization and description. Testing of software modules and software system. Form the final version of project's explanatory report - a graphical presentation and a narrative description of design's different stages.
Teaching and assessment:
Each student is assigned an individual task. The explanatory report contains two parts: documentary part and implementation part. The teachers, that are responsible for the course, assist students in the design, implementation, documentation and presentation of the task, weekly during the announced consultation hours. The project should be submitted in electronic form and should be documented by an explanatory report. The project is realizing beyond school hours. The final mark is based on the assessment of an explanatory report, program implementation and presentation of the project.

S02023 Network and Computer Security

ECTS credits: 6 **Weekly workload:** 2l+0s+0lab+2pr+1ca
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Zlatkov Zahariev, MEng, PhD; Dept. of Telecommunications; tel.: +359 82 888 663;
E-mail: pzahariev@uni-ruse.bg
Abstract:
The course in Network and computer security presents to the students theoretical information on the main modern threats to network security. The course strengthens the already acquired skills of the students in this area and present to them the types of hardware and software mechanisms and components, which are used to improve the security level of the IP-based communication systems and networks. The practical exercises are designed to develop skills for investigation of the processes, the characteristics and the methods for building the modern networks, which are to provide a higher level of security and reliability for the transmitted user information and for the access to the network resources.
Course content:
The lectures cover the basic concepts of the network security systems, their building blocks and one of their main models for implementing network security – the AAA model. Many basic steps and the components of the processes that describe the process of building systems with firewalls and intrusion detection and prevention systems are discussed as well.
Teaching and assessment:
The lectures are conducted every week and are preceding the practical exercises. All lectures are presented to the students using multimedia presentations. The exercises are conducted two hours per week in a specialized laboratory and using the necessary specialized equipment.

S02024 Information and Communication Security

ECTS credits: 6 **Weekly workload:** 2le+0se+0lab+2pr+1ca
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Zlatkov Zahariev, MEng, PhD; Dept. of Telecommunications; tel.: +359 82 888 663;
E-mail: pzahariev@uni-ruse.bg
Abstract:
The course in Information and communication security presents to the students theoretical information on the main topics in the area of the systems and the technologies for information security. The course strengthens the already acquired skills of the students in this area and present to them the types of ciphers, message integrity codes and other software components, which are used to improve the security of the information. The practical exercises are designed to develop skills about the use of the methods for providing high level of cryptographic security, protection of the users identity, the use of block and stream cyphers, the use of message authentication and integrity codes, etc.
Course content:
The course focuses on the advanced cryptographic structures and elements that are used for encryption of the data, the stream and the block ciphers, the mechanisms for ensuring the integrity of the data, the methods for providing user security, the public keys exchange systems, the generation and the use of digital certificates and more.
Teaching and assessment:
The lectures are conducted every week and are preceding the practical exercises. All lectures are presented to the students using multimedia presentations. The exercises are conducted two hours per week in a specialized laboratory and using the necessary specialized equipment.

S02027 Applications and Systems for Mobile Terminals and Devices

ECTS credits: 4 **Weekly workload:** 3l+0se+0lab+2pr
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Zlatkov Zahariev, MEng, PhD; Dept. of Telecommunications; tel.: +359 82 888 663;
E-mail: pzahariev@uni-ruse.bg
Abstract:
The Applications and Systems for Mobile Terminals and Devices course provides the students with the theoretical foundations and the basic practical knowledge, which are necessary for the development of modern applications for mobile devices and terminals that use and function on the Android operating system. Within the course, the students can use knowledge gained from the courses Object Oriented Programming, Operating systems, Programming Languages and Web programming. The knowledge gained from this course can be used in the course Mobile Cellular Radio networks, as well as for the preparation of the final diploma thesis project. The knowledge gained from this course can be additionally used as foundation for the courses from the Master degree programs in Computer systems and networks, Computer Technology and Internet and Mobile Communications.
Course content:
The course contains lectures and exercises related to the main components of the mobile applications, the workflows for development of applications with Android Studio, the use of various elements, screen layouts, menus, processes, etc. The main methods for navigating within the applications, for switching between individual activities within an application, and for switching between applications are analysed and presented within the course. The different methods for entering, processing, transmission and visualisation of information are also discussed and presented. The methods for using the hardware components of the mobile devices (camera, GPS, compass, accelerometer, communication interfaces, etc.) are described within the course. The processes for development and installation of applications on virtual and real mobile devices with Android OS are also presented and discussed.
Teaching and assessment:
The lectures are conducted every week and are preceding the practical exercises. All lectures are presented to the students using multimedia presentations. The exercises are conducted on block in a specialized laboratory and using the necessary specialized equipment.

S02028 Convergent Communication Systems

ECTS credits: 4 **Weekly workload:** 3le+0s+0lab+2pr
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Valentinov Hristov, MEng, PhD; Dept. of Telecommunications; tel.: +359 82 888 663;
E-mail: ghristov@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, MEng, PhD; Dept. of Telecommunications;
tel.: +359 82 888 353; E-mail: dkyuchukova@uni-ruse.bg
Abstract:
The main objective of this course is to provide students with in-depth understanding of Next Generation Network (NGNs) technologies. The course will cover history, overview, and how NGNs are shaping the current and future ICT landscape. Students will gain both a theoretical understanding and practical experience from laboratory work concerning the design and delivery of systems employing programmable networking technologies. The stress is put on networking APIs, SIP, IMS and converged service delivery platforms. There is a strong research and experimental aspect to this course. Students are expected to work with various NGNs technologies APIs to gain understanding in various architectural and programming aspects of NGNs and complex web and cloud-based technologies that combine various media and access network protocols.
Course content:
Students are expected to read on various topics related to NGNs and provide their own understanding of the following topics that will be covered during the lectures (the order is subject to change during the first year of the course): Historical background to present day networks; Circuit switching vs. packet switching, session control; Concepts of network evolution and convergence; Synchronous vs. asynchronous communication; Event-driven computing, parallel processing and threading; Application servers and container architectures; Reference models for current state of networks; Abstract layering model for NGNs; IP Multimedia Subsystem (IMS); The OSI-RM layers; SIP as an integrating protocol for NGNs; Application programming interfaces; OSA/Parlay; Parlay X; JAIN Operations support systems; Migration from legacy systems to NGNs; Case studies of present and possible future applications deployed in NGNs.
Teaching and assessment:
The lectures are conducted 3 hours weekly, and the practical exercises are 2 hours every weeks. The students are preparing for the exercises, using the recommended literature. For each exercise the students prepare and present to the teacher a report. The exam consists of written and oral parts.

S02029 Multimedia Systems and Technologies

ECTS credits: 4 **Weekly classes**: 3l+0s+2pr
Assessment: Continuous assessment **Type of exam:** written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Tsvetozar Stefanov Georgiev, MEng, PhD; Dept. of CST, tel.: +359 82 888 827; (+359 82) 888711;
E-mail: TGeorgiev@ecs.uni-ruse.bg
Abstract:
The objective of the course "Multimedia systems and technologies" is to familiarise students with the technology to create multimedia products, comprising text, graphic, audio and video objects according to a scenario prepared in advance, as well as with the structure of the systems for developing and recreating such products. The course examines basic graphic, sound and video file formats and compression methods and the use of some popular authoring systems. The course has input links with the courses Computer graphics, Programming languages, Web design, and parallel with Applications and systems for mobile terminals and devices.
Course content:
Multimedia – history, definitions, application area. Technology of creating multimedia products. Systems for developing multimedia products. Methods and tools for creating, editing and saving text objects. Methods and tools for creating, compressing, editing and saving graphic objects. Methods and tools for creating, compressing, editing and saving audio objects. Methods and tools for creating, compressing, editing and saving video objects. Assembling, testing and distribution of multimedia applications. Video-conferencing systems.Virtual reality.
Teaching and assessment:
The lectures familiarise students in theory with the main problems of creating multimedia products. The workshops allow each student to develop multimedia objects and include in multimedia product following a given scenario. The assessment is continuous. The final mark is the average of the marks of two tests and personal participation in class works.

S02072 Wireless Technologies for Data Transfer

ECTS credits: 4 **Weekly workload:** 2le+0s+0lab+3pr
Assessment: Exam **Type of exam:** written and oral
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Zlatkov Zahariev, MEng, PhD; Dept. of Telecommunications; tel.: +359 82 888 663;
E-mail: pzahariev@uni-ruse.bg
Abstract:
The course Wireless technologies for data transfer aims to strengthen the knowledge of the students and to present to them the major issues of wireless computer and telecommunications networks. The knowledge, the materials and the tasks during the course will help the students to develop skills for solving of engineering and technical tasks for design, modelling and development of wireless networks and the selection and configuration of network equipment and devices. The course Wireless technologies for data transfer uses knowledge from the courses on Data Transmission and Computer Communications, Networks and systems, Routing and Switching in the communication networks. Network protocols, Network Administration, Network and computer security and Information and communication security. The knowledge, gained from this course can be used in other engineering courses in the field of the telecommunication networks, the network devices and systems and would help the students during the preparation of their bachelor theses.
Course content:
The course presents different networking technologies, modulation techniques, topologies and devices, which can be used and implemented for and in the wireless networks. A detailed presentation and analysis of the modern standards for wireless communications is also provided. Some of the standards, which are included in the course are: IEEE802.11 (WiFi), IEEE802.15 (802.15.1 Bluetooth, 802.15.3 WiMedia, 802.15.4 ZigBee) and IEEE802.16 (WiMax). The students gain knowledge about the methods for planning of the wireless networks, for development of an address plan and for setting up the devices.
Teaching and assessment:
The lectures are conducted every week and are preceding the practical exercises. All lectures are presented to the students using multimedia presentations. The exercises are conducted on block in a specialized laboratory and using the necessary specialized equipment.

S02074 Mobile Cell Radio Networks

ECTS credits: 4 **Weekly workload:** 2l+0s+0lab+3pr
Assessment: Exam **Type of exam:** written test
Departments involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Teodor Bozhidarov Iliev, MEng, PhD, Dept. of Telecommunication, tel.: (+359 82) 888 839,
E-mail: tiliev@uni-ruse.bg
Principal Assistant Ivanka Dimitrova Tsvetkova, MEng, PhD; Dept. of Telecommunications;
tel.: (+359 82) 888 836; E-mail: itsvetkova@uni-ruse.bg
Abstract:
The course introduces the students with the basic standards, principles and technologies of the mobile cell radio networks. The focus of the discipline is on digital systems and technologies for mobile communications, including architecture, interface and protocol organization, technologies, services and more. They are considered from GSM to 5G, as well as their main functional network elements.
Course content:
Introduction to mobile cellular radio networks: classification, general characteristics, basic principles in mobile cellular radio networks. Global System for Mobile Communications (GSM). Third generation mobile communication systems (3G). Fourth generation LTE systems. LTE architecture. LTE interfaces. Basic communication functions. Protocol stacks on the control and user planes. Logical and transport channels in LTE. Mobility management. Features and comparison between 4G and 5G. 4G and 5G network applications. Fifth generation systems (5G). Characteristics and features of the network. Communication between devices, standards, structure and services in fifth generation (5G) systems. 5G architecture and protocols. 5G New Radio (5G NR) - features and specifications. Next generation mobile cellular radio networks.
Teaching and assessment:
The lectures are conducted 2 hours weekly, and the practical exercises are 3 hours. The students are preparing for the exercises, using the recommended literature.
Method of Assessment: 90 minutes a written test.

S01425 Diploma Thesis / S02075 State Exam

ECTS credits: 10 **Weekly classes:** 0l+0s+0lab+0pr
Assessment: defense / exam **Type of exam:** oral / written+oral
Departments involved:
Department of Computer Systems and Technologies and Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Lecturers from the Department of Computer Systems and Technologies and Department of Telecommunications
Abstract:
The diploma thesis e independent creative assignment, which is implemented under the guidance of a supervisor, and if necessary - a research consultant. Its aim is to students to demonstrate the knowledge and skills during training to achieve the goals and objectives of the thesis and defend their thesis before an State Examination Commission.
The state exam is taken before the State Examination Commission on approved syllabus that includes questions from all major disciplines. It consists of two parts - written and oral. To the oral examination shall be admitted students who have received evaluation of the written part at least Average(3).
Course content:
The diploma thesis includes: a note which includes all the basic literature, ideas, existing solutions, analyses, calculations, explanations, conclusions; graphical part which includes schematic diagrams; application with source code and / or developed by the student model or device, if it's part of the job; presentation of the thesis.
Teaching and assessment:
The Department of Computer Systems and Technologies and the Department of Telecommunications together are responsible for collecting, confirming and announcing proposals for topics of theses; distribution of students by themes and supervisors; the diploma practice; leadership, review and defense of theses.
An weekly consultation with the supervisor on which the performance of the tasks is observed is provided for students.
The student defends his/her diploma thesis or takes state exam in front of the State Examination Commission.

POSTGRADUATE PROGRAMS

POSTGRADUATE STUDIES IN ELECTRICAL POWER ENGINEERING

PROFESSIONAL STANDARDS OF A MASTER IN

ELECTRICAL POWER ENGINEERING

Degree course: **Electrical Power Engineering**
Degree awarded: **Master of Engineering (MEng)**
Professional Qualification: **Power engineer (MEng)**
Duration: **1 year (2 terms)**

The master's program in electrical power engineering is in line with the modern requirements of production, transmission, distribution and consumption of electricity. It creates excellent prospects for realization in all economy sectors.

Graduates can work in the power engineering field, the National Electricity Company, electricity distribution companies and energy departments of all enterprises in industry, agriculture, transport, construction and the public sector, in design offices and research institutes, as lecturers in secondary and higher schools, etc.

The curriculum of the training is consistent with the curricula of other similar universities in Bulgaria and abroad and it includes one elective and nine compulsory disciplines in the field of: information technology, research and optimization in power engineering, energy management and energy audit, design technology, specialized electrical equipment, electronic converters, alternative energy sources, reliability and quality of electric power supply, electrical safety, etc. The final procedure of the training is a development and defense of a diploma thesis of a research nature.

The classes are held in specialized laboratories with modern equipment, built jointly with the companies Schneider Electric, Siemens, Danfoss and others. Contemporary information technologies are used in a computer room, implemented under a project of the World Bank. In the computer room, an individual workplace and free Internet access are provided for each student.

The main knowledge and skills that the Master of Electrical Power Engineering must possess are the following: to perform, organize and manage research and design work; to design all types of electrical installations, schemes, products, equipment and objects; to manage the installation, operation, repair and testing of all types of electrical equipment, machines and apparatuses; to organize and manage the energy farms and departments in the production enterprises; to assess the economic and energy efficiency in the production, transmission and consumption of electricity; to carry out marketing and trade activities in the field of power engineering, electrical equipment and all electrical products and systems.

For participation in the program, persons with higher education with a bachelor's and master's degree in the specialties in the professional field of Electrical Engineering, Electronics and Automation can apply. For them, the duration of training in the full-time study is two terms. The duration of the part-time study is three terms.

Persons with a bachelor's or master's degree in a related engineering specialties in other professional fields, and in specialties from different field of higher education, can also apply. The duration of study is three terms in full-time form, and four semesters in part-time form. In the master's program in electrical power engineering, persons who have completed a Professional Bachelor degree in specialties in the professional field of Electrical Engineering, Electronics and Automation can also participate. For them, the duration of training in the full-time form is four terms, and in the part-time form - six terms.

CURRICULUM
of the Master's degree course in
ELECTRICAL POWER ENGINEERING

Code	*First term*	*ECTS*	*Code*	*Second term*	*ECTS*
	Compulsory subjects			***Compulsory subjects***	
SM12908	Information Technologies in Electrical Power Engineering	6	SM12915	Measurements, Control and Management in the Electrical Power Supply	4
SM12909	Research and Optimization in Electrical Power Engineering	6	SM12916	Technical Systems for Electrical Safety	4
SM12910	Specialized Electrical Equipment	6	SM12917	Alternative Energy Sources	4
SM12911	Energy Management and Energy Audit	5	SM12918	Electronic Converters in Electrical Power Systems	3
SM12912	Technology of design of electrical products	3			
	Compulsory optional subjects				
SM12913	Reliability and Quality of Electric Power Supply	4		***Graduation***	
SM12914	Electromagnetic Compatibility in Electrical Installations	4	SM12919	Master thesis	15
	Total for the term:	***30***		***Total for the term:***	***30***

Total for the degree course : 60 ECTS credits

SM12908 Information Technologies in Electrical Power Engineering

ECTS credits: 6 **Weekly workload**: 2l+0s+0lab+3pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD, Department of Electrical Power Engineering, tel: 082 888 301, E-mail: opetrov@uni-ruse.bg
Assoc. Prof. Vyara Sabova Ruseva, MEng, PhD, Department of Electrical Power Engineering, tel: 082 888 661, E-mail: vruseva@uni-ruse.bg
Abstract:
The course "Information technologies in electrical power engineering" is intended to deepen the theoretical and practical training of students in the field of IT technologies. Aims to provide specialized training to solve specific IT problems in the field as supplies, distribution, transmission and electricity production. As an independent work under the supervision of a teacher is to develop practical assignment.
Course content:
Technical, programming and technological surveying of information systems in the power sector. Information and communication technology systems in the power sector. Spatial information and providing technical objects in the power sector. Design methodology as an information process. Information management on projects in electricity. Systems for automated design in electrical power engineering.
Teaching and assessment:
Presented lectures on theoretical foundations are taught practical classes by examining of different communication elements and devices. Individual reports must be created. The exam is written by two questions. The final assessment takes into account the assessment of practical assignment.

SM12909 Research and Optimization in Electrical Power Engineering

ECTS credits: 6 **Weekly workload**: 2l+0s+0lab+3pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering,
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Anka Hristova Krasteva, MEng, PhD, Dept. of Electrical Power Engineering, tel.: 082 888 301,
E-mail: akrasteva@uni-ruse.bg
Assoc. Prof. Viara Sabova Ruseva, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 616, E-mail: vruseva@uni-ruse.bg
Abstract:
The course "Research and optimization in the power industry" allows students to acquire knowledge and practical skills needed in organizing and conducting engineering research and optimization of processes and objects of the power industry. The main methods and tools for research and optimization of processes and objects in the power industry are covered.
Course content:
Research in the power industry. Planning, organizing and conducting research in the power industry. Use of mathematical statistics in power engineering. Application of MATLAB and SIMULINK in the power industry.
Optimization in the power industry. Baseline conditions for optimal use of electricity. Optimizing the use of electrical energy in electric drives, in the transportation of fluids and flow electrothermochemical treatments. Optimize energy losses.
Training technology:
The training in the discipline "Research and optimization in electricity" is through lectures and practical exercises. Experimental models and laboratory stands are used, which are the result of the research of the lecturers and doctoral students in the department.

SM12910 Specialized Electrical Equipment

ECTS credits: 6 **Weekly classes:** 2l+0s+3lab+0pr
Assessment: Exam **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Kiril Aleksandrov Sirakov, M.Sc.Eng. PhD, Department of Electrical Power Engineering,
tel.: +359 82 888 364; E-mail: csirakov@uni-ruse.bg
Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301;
E-mail: opetrov@uni-ruse.bg
Abstract:
The goal of the subject is knowledge acquirement about specialized elements from electrical equipment of machines, aggregates and technological lines. On this basis students must be able to design contemporary electrical equipment. The ingoing links relate with the bachelor degree course. The outgoing links are with Technical safety systems, Design and production of electrical goods technology, Electronic transformers in the electrical power systems, Final Year project development.
Course content:
Electrical equipment dynamics. Special features in electrical equipment of cranes and electro-telphers, of elevator's electrical equipment and explosively dangerous zones. Transforming elements in electrical equipment. Special electrical power equipment of metal cutting machines with numerical programming control. Application of programmed controllers in electric equipment in technological processes.
Teaching and assessment:
Visual aids are used during the lectures. Operative models are used during the laboratory exercises. Oral discussions and short tests (up to 5 minutes) are done during the lectures and laboratory exercises. Protocols submission is required for the acceptance of the laboratory exercises. The semester can be validated if all exercises are done, submitted and defended and if the student attended more than 50% of the lectures. The exam is written on two topics from the questionnaire and is followed by oral discussion on parts of other topics.

SM12911 Energy Management and Energy Audit

ECTS credits: 6 **Weekly classes**: 2l + 2s + 0lab + 0pr
Assessment: Continuous assessment **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Viara Sabova Ruseva, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 616,
E-mail: vruseva@uni-ruse.bg
Abstract:
The course "Energy Management and Energy Audit" gives students the opportunity to acquire knowledge about the organizational and management structure of electricity companies and the regulatory framework that regulates their activities. By studying the course students get acquainted with the basics of management in individual power units and can gain theoretical knowledge to assess the energy efficiency of production processes and sites in the field of "Electricity" and practical skills for their energy audit.
Course content:
Energy management. National strategy in the field of energy. Functions and organizational - management structures of the institutions in the branch "Electricity". Regulatory framework for energy management. Management of the activity in the electric power companies.
Energy audit. National Energy Efficiency Program. Ordinances, rules and guidelines for energy efficiency inspection of production processes and sites. Structure and content of energy audit reports.
Teaching and assessment:
The training is carried out through lectures and seminars.
The lecture material on the course is developed on the basis of the current structure in the sector "Electricity" (ministry, agencies, companies) and the laws, regulations and rules in force for it.
For the seminars the students are prepared from the presented lecture material and the indicated literature. During the classes the normative requirements, the methodologies for conducting energy audit and finding solutions for achieving better energy efficiency are considered. At the beginning of each seminar there is an individual control for the preparation of students.
To form the current assessment of the discipline, two written tests are conducted.

SM12912 Technology of Design of Electrical Products

ECTS credits: 3 **Weekly classes**: 3l + 1s + 0lab + 0pr
Assessment: Exam **Type of exam**: written
Methodology management:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Anka Hristova Krasteva, MEng, PhD - Dept. of Electrical Power Engineering, tel.:+359 82 888 301, E-mail: akrasteva@uni-ruse.bg
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 661, E-mail: kkoev@uni-ruse.bg
Abstract:
In the course "Design Technologies and Production of Electrical Equipment", the students study the regularities in the process of designing and production of separate elements and the article as a whole. The objective course is to familiarize students with the projection methodology and production of electrical equipment. Because of the great variety of articles and their constructive forms, the technological processes are examined by a constructional and technological principle. A special attention is paid to the production of more important systems specific to the electrical industry: magnetic systems, current-conducting systems, windings and electrical insulation systems.
Course content:
Basic concepts and characteristics, the main point and tasks, main issues connected with the technological process design. Manufacture of magnetic systems, windings, contact bodies and electrical insulation systems.
Teaching and learning methods
The course ”Design Technologies and Production of Electrical Equipment” includes lectures and seminars. At the lectures the students are familiarized with the principles of designing and production of technical articles. At the seminars different examples from the practice are given.
The form of students‘ examination is continuous assessment.

SM12913 Reliability and Quality of Electric Power Supply

ECTS credits: 4 **Weekly classes**: 2l + 0s + 1lab + 0pr
Assessment: Exam **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering,
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 661, E-mail: kkoev@uni-ruse.bg;
Assoc. Prof. Vyara Sabova Ruseva, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 616, E-mail: vruseva@uni-ruse.bg.
Abstract:
The subject includes: reliability characteristics and indices of electric power systems with the analyze of the profilactic maintenance and hazard cases; the methods and models for its assessment of different customers about project and exploitation of the electric power systems; acquisition and data processing; the methods and possibilities of increasing the realibility; the reliability forecasting models and the technical optimiziation decisions models and the power quality effect to the reliability.
Course content:
Electrical power systems reliability characteristics and indices. Methods and models of reliability assessment. Influence of the technical maintenance organization of the electric power supply systems and reliability of the commutation apparatus, protective relays and system automation on the reliability of the electric power supply systems. Evaluation and optimization reliability features of different power supply systems customers. Analysis the project and exploitation power systems reliability. Power quality effects on the power systems reliability.
Teaching and assessment:
The lection’s material is presented by present multimedia presentation techniques. The laboratory exercises follow the lectures. Practical problems are solved on the laboratory exercises. The current oversight is being realized with examining the students before the particular exercise and at the end when they have to answering the questions and guesting the solves of real problems. The exam is conducted through written composing of questions the lectures’ material. There is also oral exam on some of the main problems of the subject.

SM12914 Electromagnetic Compatibility in Electrical Installations

ECTS credits: 4
Weekly workload: 2l+0s+1lab+0pr
Assessment: Exam
Tupe of exam: Written
Departments:
Department of Electrical Power Engineering, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Eng. Ivaylo Stefanov Stoyanov, PhD, Dept. of EPE, Phone.: +359 82 888 483,
E-mail: stoyanov@uni-ruse.bg
Assoc. Prof. Eng. Konstantin Koev, PhD, Dept. of EPE, Phone: +359 82 888 201, E-mail: kkoev@uni-ruse.bg
Abstract:
The subject includes: basic electromagnetic interference (EMI) sources for electrical installations and their diffusion principles; resources and methods for measurement EMI parameters; the EMI influence over electrical installations and their elements; EMI standardization. An important attention is spared for design and choice of EMI limiting technical resources. The students receive theoretical and practical knowledge for EMI evaluation and EMI limiting methods and resources to electromagnetic compatibility (EMC) enhancing for electrical installations. The entry connections are with Electrical materials, Theoretical electrical engineering, Electrical Networks and Systems and others. The exit connections are with the Diploma thesis and the students' practice realization.
Course syllabus:
The point of electromagnetic compatibility. The EMC situation. Electromagnetic interference for electrical installations. Electromagnetic interference diffusion for electrical installations. Standardization and evaluation of electromagnetic interference. The EMC situation for electrical installations. EMI determine and evaluating methods. Limiting the EMI adverse effect on the electrical installations.
Teaching and assessment:
The tuition is putted into effect with the support of lectures and laboratory exercises. Contemporary technical devices to present information are used for displaying the lecture material. The laboratory exercises are once at an interval of two weeks and are two academic hours long. The current oversight is being realized with examining the students before the particular exercise. The exam is conducted through written composing of two questions the lectures' material. There is also oral exam on some of the main problems of the subject.

SM12915 Measurements, Control and Management in the Electrical Power Supply

ECTS credits: 4
Weekly classes: 3l+0s+4lab+0pr
Assessment: Exam
Type of exam: written
Departments involved:
Department of Electrical Power Engineering, Faculty of Electrical engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Vyara Subova Ruseva, MEng, PhD, Department of Electrical Power Engineering,
tel.: +359 82 888 616, E-mail: vruseva@uni-ruse.bg
Abstract:
The aim of the subject is to introduce the students to the structure, the alternative and the application of the contemporary instruments and systems for measurement, checking and operating in the electrical power systems.The subject is based on knowledge, obtained during the courses for bachelor's degree and courses for qualification degree-Master – Investigation end Optimization in the Electrical Power Systems, Computer technologies in Electrical Power Systems, ext. The initial connections are with the Final Year project.
Course content:
Microprocessor devices and systems, used in the electrical power systems. Measurement, checking and operating of the active and reactive power and energy. High harmonics in the Electrical Power Supply Systems. Checking and operating the losses of the electrical power and energy. Telemechanical systems for measurement, checking and operating in the Electrical Power Supply.
Teaching and assessment:
Suitable technical devices and prospective materials of foreign and Bulgarian companies are used for displaying the lecture material. Results from already conducted investigations are also used. During the laboratory exercises students investigate and become acquainted with the contemporary devices for measurement, operation and checking, used in the Electrical Power Supply. The students have the opportunity to program and/ or check some of the devices and also to practice computer modulating, investigation and operating the processes in the electrical networks. The exam includes a written part on test from the lecture material, which is followed by oral discussion.

SM12916 Technical Systems for Electrical Safety

ECTS credits: 4 **Weekly workload**: 3l+0s+3lab+0pr
Assessment: Continuous assessment **Tupe of exam**: Written
Departments:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Eng., Ivaylo Stefanov Stoyanov, PhD, Dept. of EPE, Phone.: +359 82 888 483,
E-mail: stoyanov@uni-ruse.bg
Abstract:
The course "Technical systems for electrical safety" is designed for students majoring in "Electrical Engineering and Electrical Equipment" for the educational qualification degree - "Master". It gives students knowledge about electrical safety techniques when working with low and high voltage systems. The taught material is supplemented with case studies from practice, through which students acquire skills for management decisions.
Course syllabus:
Electrotrauma. Electrical insulation. Measurement of the electrical resistance of insulation in networks with voltage up to 1000 V. Means for continuous monitoring of the condition of the electrical insulation. Electrical safety and neutral mode. Zeroing. Technical requirements for the zeroing system. Electrical devices for protective shutdown. Technical measures to ensure electrical safety in the main sectors of industrial production. Static electricity. Sources of static electricity. Protection of the main technological equipment. Lightning protection. Technical lightning protection systems. Technical systems for fire and explosion detection.
Teaching and assessment:
Students' education is based on classical pedagogical forms. On some topics the use of aspectomat and videos is envisaged. The lectures clarify the theoretical formulations and methods for determining and analyzing the indicators for diagnostics of electrical networks and systems. During the exercises specific practical tasks are solved. The exam is written and oral. Each student draws two exam tickets, develops the relevant questions in writing.

SM12912 Alternative Energy Sources

ECTS credits: 6 **Weekly classes**: 3l + 1s + 0lab + 0pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD - Dept. of Electrical Power Engineering,
tel.:+359 82 888 201, E-mail: kkoev@uni-ruse.bg
Prof. Eng. Ivaylo Stefanov Stoyanov, PhD, Dept. of EPE, Phone.: +359 82 888 483,
E-mail: stoyanov@uni-ruse.bg
Abstract:
The course Alternative Energy Sources (AIE) is studied by students of specialty in Power Engineering and Electrical Equipment and aims to form the necessary engineering knowledge for the use of AIE.
The input connections are: Higher Mathematics, Heat Engineering, Renewable Energy Sources and Energy Technologies, Energy Management, and the output connections are the diploma projection.
Course content:
The course includes topics related to energy potential and environmental balance, the use of solar energy (thermal and photovoltaic installations), wind energy, water (mini hydropower plants), biogas plants and systems, heat pumps and fuel cells, Co-generators and combined installations and systems for energy supply, as well as waste recovery.
Teaching and assessment:
The training in the discipline is conducted through lectures and laboratory exercises. The topics of the laboratory exercises are related to the lecture course. The cycle for the preparation of the students in AIE is closed by the technology of conducting the laboratory exercises set in the program. At the lectures, students learn the principles of projection and manufacture of electrical products. The seminars cover various examples from practice.

SM12918 Electronic Converters in Electrical Power Systems

ECTS credits: 3 **Weekly workload**: 2l+0s+3lab+0pr
Assessment: Continuous assessment **Tupe of exam**: Written
Departments:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Eng. Ivaylo Stefanov Stoyanov, PhD, Dept. of EPE, Phone.: +359 82 888 483,
E-mail: stoyanov@uni-ruse.bg
Assoc. Prof. Eng. Konstantin Koev, PhD, Dept. of EPE, Phone: +359 82 888 201, E-mail: kkoev@uni-ruse.bg
Abstract:
The subject “Electronic converters in electrical power systems” has the objective to acquaint the students with the theory and practice in power electronic converters and their control systems in different aspects of electrical power and electrical equipment. The course discusses the AC-AC, AC-DC converters and pulse width modulation (PWM), analyzes control systems and over-voltage and over-current protections of power electronic converters. The subject has the following prerequisite subjects: Higher Mathematics, Theory of electrical engineering, Electronics, Electrical transport. The subject is a prerequisite for Reliability of electrical systems and Final Year project.
Course syllabus:
Energy indices for dependent converters. Steerable AC-DC converters as a source of supreme harmonics in a supply grid. Methods for improvement of energy indices of steerable AC-DC converters. Stabilized impulse supply sources. AC-DC converters with improvement characteristics. Application of electronic converters. Protections of electronic converters.
Teaching and assessment:
Technical means as projectors and other media as well as classical lecture forms are used in the course. The study material is supported with appropriate illustrations. Students have to be prepared in advance for each exercise. The course finishes with an exam. The final rating will depend on the work done throughout the whole semester.

SM12919 Master Thesis

ECTS credits: 15 **Weekly classes**: 0l + 0s + 0lab + 0pr
Assessment: Official defense **Type of exam**: oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Consultants:
Lecturers from the Department of Electrical Power Engineering
Abstract:
The Master thesis is a major part of the Master’s program in Electrical Power Engineering. It is a solution of an engineering problem, developed under the guidance of a scientific supervisor. Its aim is the students to demonstrate their knowledge and skills acquired during their education in the field of electrical power engineering. The thesis enables students, graduating the degree “Master - Power Engineer”, to demonstrate their abilities in designing and developing original projects in the field of electrical power engineering, to work independently, to demonstrate initiatives, professional knowledge, skills and competencies. The Master thesis is reviewed and defended with the State Examination Commission.
Course content:
The Master thesis consists of a written report that includes state-of-the art, description of the proposed solution (used design methods, calculations and others), summaries and conclusions. The graphical part includes block diagrams, principle electric circuits, charts and other graphical results. During the defense, the students have to demonstrate prototypes and models made by them.
Teaching and assessment:
The Department of Electrical Power Engineering is responsible for the approval and announcement of the Master Thesis subjects, as well as for the supervision, the review and for the organization of the defense of the Master Thesis. The students have tutorials with their supervisors during the development of the Master Thesis.
The students elaborate their thesis under the supervision of lecturers from the Department or external experts in the field of power engineering. The State Examination Board assesses the report and the presentation of each student with two separate grades.

POSTGRADUATE STUDIES IN RENEWABLE ENERGY SOURCES AND TECHNOLOGIES

PROFESSIONAL STANDARDS OF A MASTER IN

RENEWABLE ENERGY SOURCES AND TECHNOLOGIES

Degree course: **Renewable energy sources and technologies**
Degree awarded: **Master**
Professional Qualification: **Master in Electrical Power Engineering (MEng)**
Duration: **1 years (2 terms)**

The Master's course in "Renewable Energy Sources and Technologies" is in line with the current trends in electricity production based on solar, hydro, bio and wind energy sources. It provides excellent opportunities for professional realization in a new strategic direction.

The students who have completed the course can work in the field of power engineering, the National Elelectricity Companyvand in the energy sectors of all business organizations from industry, agriculture, transport, construction and tourism. The knowledge obtained is sufficient to solve a variety of tasks related to exploration, design, operation and management of renewable energy sources.

The curriculum in which the training takes place is in line with the curricula of leading universities. It includes the following subjects: mathematical modeling of objects and processes in renewable energy, solar energy plants and farms, bioenergy systems, wind energy plants and farms, computer technologies and renewable energy management systems, hydro power systems and systems, design and operation of installations and parks with renewable energy sources, Economics and management of plants and farms with renewable energy sources and others. The curriculum encompasses contemporary elective subjects such as: main electrical and auxiliary furnishing of renewable energy plants and farms, dynamics of renewable energy installations, technology and audit in the construction of renewable energy systems, integration of renewable energy systems into the power network.

The classes are held in specialized laboratories with a modern equipment built with the companies Schneider Electric, Siemens and Danfos. Modern information technologies in a computer room executed under a project with the World Bank are used. The computer room has individual work places and free Internet access for every student. Opportunities for summer internships in leading European companies in the field of renewable energy are provided.

The training in the full-time form of the Master's course in "Renewable Energy Sources and Technologies" is done in two consecutive semesters. The closing procedure is a defense of a thesis.

The basic knowledge and skills acquired by the masters in "Renewable Energy Sources and Technologies" allow for a complex of activities. The activities concern renewable energy sources and include organizing and conducting research and design work; design of electrical installations, facilities and objects; installation, operation, repair and testing of all types of electrical equipment, machines and apparatuses; organizing the work and activities of energy holdings and departments in manufacturing plants; energy management and others.

For training in the course, persons with a bachelor's or master's degree in Electrical Engineering, Electronics and Automation. The program is also open to persons who have completed a related-engineering degree in another professional field or a degree in different field of higher education.

CURRICULUM
of the Master's degree course in
RENEWABLE ENERGY SOURCES AND TECHNOLOGIES

Code	*First term*	*ECTS*	*Code*	*Second term*	*ECTS*
	Compulsory subjects			***Compulsory subjects***	
SM12980	Mathematical modeling of renewable energy objects and processes	5	SM12987	Computer technologies and systems for management of renewable energy objects	3
SM12981	Solar energy systems and farms	7	SM12988	Hydro power equipment and systems	3
SM12982	Bioenergy systems	5	SM12989	Design and operation of renewable energy systems and farms	3
SM12983	Wind power plants and farms	7	SM12990	Economics and management of renewable energy systems and farms	2
SM17867	Practicum on Renewable Energy Sources	3	SM12993	Connection of renewable energy systems to the power grid	1
	Compulsory optional subjects			***Compulsory optional subjects***	
SM12985	Main electric-power and auxiliary equipment for renewable energy systems	3	SM12992	Technology and audit in the construction of renewable energy facilities	3
SM12986	Dynamics of the renewable energy systems	3	SM17870	Normative base and project management	3
				Graduation	
			SM12919	Master thesis	15
	Total for the term:	***30***		***Total for the term:***	***30***

Total for the degree course: 60 ECTS credits

SM12980 Mathematical modeling of renewable energy objects and processes

ECTS credits: 5 **Weekly workload**: 2l+2s+0lab+0pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering (EPE), Faculty "Electrical Engineering, Electronics and Automation"
Lecturers:
Assoc. Prof. Anka Hristova Krasteva, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301, E-mail: akrasteva@uni-ruse.bg
Assos. Prof. PhD Orlin Petrov, Dept. of Electrical Power Engineering, tel. +359 82 888 455
Annotation:
The course on "Math Modelling of device and Processes from renewable Energetic" is design for the students from a master degree course "Renewable Ebergy Sources and Technology'.
The aim of this class is to introduce the students with different methods for modeling and their application dor device and process from renewable energetic.
The "Math Modeling of device and Processes from renewable Energetic" classes are based on the knowledge, acquired from the students from previous classes from a bachelor degree and the classes "Solar power systems and farms" and "Economic or renewable Energy Sources". It is the basis for future classes like "Design and Operation Conditions of Installations and Power farms with RES", "Technology and Audit on Building of renewable Energy Installations" and diploma design.
The obtained knowledge can be applied in different fields of engineering practice and in the design of renewable energy installations.
Course syllabus:
The role of experiment in research. Single-factor and multi-factor regression analysis. Planning of multi-factor optimization. Modeling of the sun radiation. Modeling of systems using solar energy – math model of solar collector, modeling of system for hot water, modeling of system for house heating.
Teaching and learning methods:
The subjects of the lectures introduce the students to the methods for math modeling. The exercises follow the lectured material. They are worked as the students separated in subgroups. The students have to be ready for the exercise and the prepare a report on it. The rating of this subject is formed from results of written exam.

SM12981 Solar energy systems and farms

ECTS credits: 7 **Weekly classes:** 3l+ 0s+2lab+ 0pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Ivaylo Stefanov Stoyanov, Department of Electrical Power Engineering, Phone: (+359 82) 888 843, E-mail: stoyanov@uni-ruse.bg.
Assoc. Prof. Kiril Sirakov, Department of Electrical Power Engineering, Phone: (+359 82) 888 364, E-mail: csirakov@uni-ruse.bg
Annotation:
The aim of this class is to introduce the students with some specific parts, construction and the operation conditions of the power farm and the solar installations.
The basic terms and definitions from the area of power supplying, electrical loads and electrical power are begin introduced. The students are introduced with the constructive features of the main types of electrical drives automation, the choosing of electrical engines and regimes of operation. The main accent falls on the renewable energy and the related technologies. Some aspects of the energy efficiency control in the industrial sector, are also being discussed.
The Solar Energy Installation and Power Farm classes are based on the knowledge, acquired from the students from previous classes from a bachelor degree on Electrotechnical, Electronics and Automation..
Course syllabus:
Solar energy. Methods and technical equipments for measurements of the solar radiation. Determination of resource on the solar energy. Utilization of the solar energy. Thermal collectors and systems. Photovoltaic panels. Solar energy plants and photovoltaic power farms. Accumulate of the solar energy. Accumulate of the electrical energy. Economics of the solar energy installations.
Teaching and learning methods:
The teaching is based on the usage of classical pedagogic forms. For some of the topics projecting materials and videos are being shown. The laboratory exercises follow the lecture topics and have practical orientation. When exploring the properties of semi-conductors, computer modeling is utilized. The exam is written and the results from the individual work are being considered as well. At the written exam the students work on two question from the lectures, which help to estimate the degree of knowledge.

SM12982 Bioenergy systems

ECTS credits: 5 **Weekly classes:** 2l+ 0s+2lab+ 0pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Eng. Ivaylo Stefanov Stoyanov, PhD, Dept. of EPE, Phone.: +359 82 888 483,
E-mail: stoyanov@uni-ruse.bg
Assoc. Prof. Eng. Konstantin Koev, PhD, Dept. of EPE, Phone: +359 82 888 201, E-mail: kkoev@uni-ruse.bg
Annotation:
The aim of this class is to introduce the students with renewable energy made available from materials derived from biological sources (Bioenergy). The students studies the technologies and the techniques from the field of bioenergy. In its broader sense it includes biomass, the biological material used as a biofuel, as well as the social, economic, scientific and technical fields associated with using biological sources for energy. This is a common misconception, as bioenergy is the energy extracted from the biomass, as the biomass is the fuel and the bioenergy is the energy contained in the fuel. Some aspects of the organization, the working conditions and the investment control, are also being discussed.
Course syllabus:
Byproducts from a variety of agricultural processes. Ethanol plants to be energetically self-sufficient and even sell surplus electricity to utilities. Energy from wood.
Biomass from recently living organisms, includes plants, animals and their byproducts. Renewable Energy Source based on the carbon cycle, unlike other natural resources such as petroleum, coal, and nuclear fuels. Animals housed in industrial-sized farms. Agricultural products being grown for biofuel production: corn, switchgrass, and soybeans, rapeseed, wheat and sugar, palm oil and miscanthus, sorghum, jatropha. Biodegradable outputs from industry, agriculture, forestry and households. Examples of biodegradable wastes include straw, timber, manure, rice husks, sewage, and food waste.
Teaching and learning methods:
The teaching is based on the usage of classical pedagogic forms. For some of the topics projecting materials and videos are being shown. The laboratory exercises follow the lecture topics and have practical orientation. When exploring the properties of semi-conductors, computer modeling is utilized. The exam is written and the results from the individual work are being considered as well. At the written exam the students work on two question from the lectures, which help to estimate the degree of knowledge.

SM12983 Wind power plants and farms

ECTS credits: 7 **Weekly classes**: 3l + 0s + 2lab+ 0pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Eng. Ivaylo Stefanov Stoyanov, PhD, Dept. of EPE, Phone.: +359 82 888 483,
E-mail: stoyanov@uni-ruse.bg
Assos. Prof. PhD Orlin Petrov, Dept. of Electrical Power Engineering, tel. +359 82 888 455,
E-mail: opetrov@uni-ruse.bg
Annotation:
The course aims to form in the students the basic theoretical knowledge and practical skills needed in the construction and operation of wind energy systems and parks. Input links: Mathematical modeling of objects and processes from renewable energy, the dynamics of the installations of renewable energy sources and so on. Output links: Design and operation of installations and parks with renewable energy sources, diploma project.
Course content:
General Information on wind power stations. Specifications for AC generators. Turbines for wind power stations. Braking systems. Climatic and economic conditions for wind energy business. Wind circulations in Bulgaria. Energy and power of the wind. Wind energy audit and analysis of wind energy. Foundations, lightning protection, earthling and joining of wind power station to power system. Wind farms.
Teaching and assessment:
During the lectures, the theoretical subjects are read on topics. Before each laboratory, exercise is conducted monitoring in the form of tests and oral examination. The results of the controls during exercise are recorded in the definitive assessment of the exam. The exam is written by development of two questions from the syllabus**.**

SM17867 Practicum on Renewable Energy Sources

ECTS credits: 3 **Weekly classes:** 0l+ 0s+0lab+ 3pr
Assessment: Ongoing assessment **Type of exam**: written, oral
Departments involved:
Department of Electrical Power Engineering, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Kiril Sirakov, Department of Electrical Power Engineering, Phone: (+359 82) 888 364,
E-mail: csirakov@uni-ruse.bg
Assoc. Prof. Ognyan Dinolov, Department of Electrical Power Engineering, Phone: (+359 82) 888 202,
E-mail: odinolov@uni-ruse.bg
Annotation:
The aim of the course Practicum on Renewable Energy Sources is for students to acquire knowledge and skills applicable in electrical engineering practice for the construction and operation of renewable energy farms.
The input connections for the course are the knowledge acquired during secondary education and bachelor's studies.
The output connections include the following courses: Technology and Audit in the Construction of Renewable Energy Facilities, Design and Operation of Renewable Energy Systems and Farms, Connection of Renewable Energy Systems to the Power Grid, as well as Master thesis and the students' future professional work.
Course syllabus:
Main facilities in power supply systems. Basic components and electrical devices in energy facilities with renewable energy sources. Instruments for measuring electrical quantities, measurement errors. Management and operation of renewable energy sites.
Teaching and learning methods:
The training is conducted through practical exercises, site visits, and supervised extracurricular work. The teaching material is accompanied by carefully selected examples of solutions in the field. A multimedia projector is used to illustrate the material. The practical exercises are carried out within a 3-hour timeframe. Experimental and operational installations for energy production from alternative sources are used.

SM12985 Main electric-power and auxiliary equipment for renewable energy systems

ECTS credits: 3 **Weekly classes**: 2l + 0s + 0lab + 1pr
Assessment: Continuous assessment **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Kyril Aleksandrov Sirakov, M.Sc.Eng. PhD, Department of Electrical Power Engineering,
tel.: +359 82 888 364, E-mail: csirakov@uni-ruse.bg
Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301;
E-mail: opetrov@uni-ruse.bg
Abstract:
The course on main and auxiliary electrical equipment of systems with RES is included as optional in the curriculum of students in the Master course „Renewable energy sources and technologies“. It acquaints students with the necessary main and other ancillary equipment and electronic control systems, without which the operation of the systems with RES would not be efficient.
Input connections: the courses „Solar power systems and farms“, „Wind power systems and farms“, „Bioenergy systems“, Output connections: the following courses of the said course, the diploma project developing and future work of the students.
Course syllabus:
The course enables students to become acquainted with electric-power equipment and devices for control of PV-systems, wind generators, small hydro power plants, systems for generation of hydrogen and oxygen (using energy from RES), hybrid systems producing hot water. Protection of power units, using energy from renewable sources.
Teaching and learning methods:
Training is conducted through lectures, practical exercises and controlled non-audience work. Lectures are combined with appropriately selected examples of practical solution. A multimedia projector is used in order to illustrate the lectures. The practical exercises are carried out within 2 or 3 hours. Experimental and existing installations for producing energy from alternative sources are used.

SM12986 Dynamics of the renewable energy systems

ECTS credits: 3 **Weekly classes:** 2l + 0s + 0lab + 1pr
Assessment: Continuous assessment **Type of exam:** written and oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Kyril Aleksandrov Sirakov, M.Sc.Eng. PhD, Department of Electrical Power Engineering, tel.: +359 82 888 364, E-mail: csirakov@uni-ruse.bg
Assoc. Prof. Ognyan Nikolaev Dinolov, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 531; E-mail: odinolov@uni-ruse.bg
Annotation:
The course on dynamics of systems with renewable energy sources (RES) considers the main issues in the electromagnetic and electromechanical transients and special rates in the power networks supplied by RES. The course inputs from the undergraduate training are: Mathematics, Physics, Theoretical Electrical Engineering, Electrical Machines, Electrical Power Networks and Systems, Electric Drives, Electric Power Stations and Substations Engineering, Protective Relaying, Short Circuits, Electrical Equipment, Electric Supply and Power Technologies. The output connections are Design and Operation of Systems and Farms with RES, Connection of Installations with Renewable Energy Sources to the Electric Power System, Diploma Project Developing and students' future work in design, research and expert laboratories and companies.
Course syllabus:
Electromagnetic transients in electric power networks supplied by RES. Transients in synchronous and induction electrical machines. Electromechanical transients - static and dynamic stability of parts of the electric power system.
Teaching and learning methods:
The training in the course on Dynamics of Systems with Renewable Energy Sources is conducted through lectures and practical exercises. Lectures are held according to a pre-announced schedule by topics. The continuous assessment will be accomplished through examination of students during the practical exercises and two written tests.

SM12987 Computer technologies and systems for management of renewable energy objects

ECTS credits: 3 **Weekly classes:** 3l + 1s + 0lab + 1pr
Assessment: Exam **Type of exam:** written
Methodology management:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Orlin Lyubomirov Petrov, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301; E-mail: opetrov@uni-ruse.bg
Assoc. Prof. Anka Hristova Krasteva, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 301, E-mail: akrasteva@uni-ruse.bg
Annotation:
Basic intelligence about the architecture, technical date and operation of the programmable logic controllers (PLC) are given in the course. The basic structure and the operation of the main input-output PLC modules are considered in details. Especially attention is devoted on PLC programming and use of advanced graphic programming languages.
Syllabus contents:
System architecture and functions of PLC. Analog input/output modules. Digital input/output modules. Basic PLC communications, interfaces and protocols. PLC software structure. Textual and graphics PLC IEC 61131-3 programming languages. Industrial networks Profibus, ControlNet and Industrial Ethernet.
Teaching and learning methods:
The available technical teaching devices are used during the lectures. Laboratory exercises are cycles organized and carried out at teaching laboratory. Students are provided with user manuals for their teaching preparation. Before classes, the students teaching backgrounds are examined. The results by experiments and software developments are entered in individual report. The final student assessment is formed on the base of a collection of the exercises assessment and written exam assessment.

SM12989 Hydro power equipment and systems

ECTS credits: 3 **Weekly classes**: 3l + 0s + 2lab + 0pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering, Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Eng. Ivaylo Stefanov Stoyanov, PhD, Dept. of EPE, Phone.: +359 82 888 483,
E-mail: stoyanov@uni-ruse.bg
Assos. Prof. PhD Orlin Petrov, Dept. of Electrical Power Engineering, tel. +359 82 888 455,
E-mail: opetrov@uni-ruse.bg
Abstract:
The course Power devices and system aims to introduce students to master course in the specialty Renewable energy sources and technologies with basic concepts related to hydropower and its transformation, the basic indicators of water turbines and their energetic characteristics; types of water turbines and the choice of type of water turbine, the species of hydro – electric centrals, selection of aggregates in hydropower turbosistems; the regimes of working and dynamic characteristics of energy turbosistems.
Course content:
Water power. Conversion of hydropower. Hydropower. Hydro potential. Wave and tidal. Generate of electricity. Types of converters. Water turbines. Gross and net drop. Basic indicators of water turbines. Principle of operation of water turbines. Types of water turbines. Classification of hydraulic turbines. Select the type and calculate the basic amount of water turbine. Characteristics of water turbines. Types of hydro-electric plants. Loading diagrams. Ways to accumulation of hydropower Comparative analysis of methods for accumulation of energy. Studies in the construction of small hydropower plants. Determining the type of turbine. Electrical part of small-scale hydro power station. Performance of small hydropower plants. Select the number of aggregates in hydropower turbosistems. Technical and economic indicators.
Teaching and assessment:
The organization of the course is in two forms – lectures and practical exercises. The topics of the lectures enable students to get acquainted with the basic theoretical issues studied, and they precede the seminars. The course ends with an examination that is conducted in writing with the development of two questions followed by oral examination.

SM12989 Design and operation of renewable energy systems and farms

ECTS credits: 3 **Weekly classes**: 2l + 1s + 0lab + 1pr
Assessment: Exam **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD, Dept. of Electrical Power Engineering,
tel.:+359 82 888 201; +359 82 888 661; E-mail: kkoev@uni-ruse.bg
Assoc. Prof. Kyril Aleksandrov Sirakov, M.Sc.Eng. PhD, Department of Electrical Power Engineering,
tel.: +359 82 888 364, E-mail: csirakov@uni-ruse.bg
Abstract:
The Design and Service of Renewable Energy Sources Farms and Installations is basic syllabus for the students from master degree on “Renewable Energy Sources and Technology”.
The aim of the learning is the students to improve some knowledge and practice on design and service of renewable energy sources farms and Installations and they may to use basic methods of solving of practical problems.
Course content
Basic steps on design of renewable energy sources farms and installations, Solar irradiance, Installations of converting solar energy to heat, Design of solar systems, Structure and service of installations of converting solar energy to heat, Energy efficiency assessment of solar systems, Design of photovoltaic systems, Design and service of a mini wind generator and hydropower miniplants, and a fuel cell, Service of the MicroGrid energy systems.
Teaching and assessment:
The lection’s material is presented by present multimedia presentation techniques, special software and movies. The seminary exercises follow the lectures. Practical problems are solved on the practics. The current oversight is being realized with examining the students before the particular exercise and at the end when they have to answering the questions and guesting the solves of real problems. The exam is conducted through written composing of questions the lectures’ material. There is also oral exam on some of the main problems of the subject.

SM12990 Economics and management of renewable energy systems and farms

ECTS credits: 2 **Weekly classes:** 2l + 1s + 0lab + 0pr
Assessment: Exam **Type of exaт:** written and oral
Departments involved:
Department of Electrical Power Engineering, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Eng. Ivaylo Stefanov Stoyanov, PhD, Dept. of Electrical Power Engineering, Phone.: +359 82 888 483, E-mail: stoyanov@uni-ruse.bg
Assoc. Prof. Vyara Sabova Ruseva, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 616, E-mail: vruseva@uni-ruse.bg
Annotation:
The course considers: basic and specific questions about economics and management of the new eпегду technologies using renewable energy sources (RES) and the renewable energy farms (REF) build оп this base.
Course syllabus:
Development and perspectives of renewable energy technologies. Energy balance of installations, eпегду farms and systems with RES. Energy-economical problems. Basic and working funds of REF. Costs and tariffs of the energy, produced by RES. Economic effciency of the investments in REF. Organization and management of the enterprises with RES. Organization and planning of work and wages in REF. Stimulation and analysis of the REF activity.
Teaching and learning methods:
The lectures are held according to a pre-announced schedule by topics. The topics of all seminars are related to the lecture course. The technology of conducting the seminars set in the program closes the cycle for the preparation and implementation of the audit for the energy efficiency of the renewable energy sources.

SM12993 Connection of renewable energy systems to the power grid

ECTS credits: 3 **Weekly classes**: 2l + 2s + 0lab + 0pr
Assessment: exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering, Faculty Electrical engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Vyara Sabova Ruseva, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 616, E-mail: vruseva@uni-ruse.bg
Prof. Eng. Ivaylo Stefanov Stoyanov, PhD, Dept. of EPE, Phone.: +359 82 888 483,
E-mail: stoyanov@uni-ruse.bg
Abstract:
The course aims to acquaint students with the legal framework for connecting power plants for the production of electricity from renewable energy sources and with the peculiarities of measuring electricity in this case. The input connections are with the disciplines from the curriculum for Bachelor's degree: Electrical measurements; Digital and microprocessor technology; Electrical networks and systems; Electrical part of power plants and substations; Power supply; Relay protection; Power management; Automated systems in the power supply and with the disciplines from the curriculum for the Master's degree: Mathematical modeling of objects and processes of renewable energy, Computer technologies and systems for management of renewable energy systems, Design and operation of power plants and fleets. The initial connections are with the diploma project.
Course content:
The following main topics are considered: cost and price of electricity from renewable energy sources; innovation and pricing policy; regulatory framework for the connection of energy sites; measurement, control and management of active and reactive power and energy; financing of projects for the purpose of construction of sites for production of electricity from renewable energy sources, etc.
Teaching and assessment:
Modern technical means such as a multimedia projector, etc. are used to illustrate the lecture material. Prospectus materials of leading companies in the respective field are used. During the seminars specific cases related to the development of the necessary documentation for the connection of energy sites producing electricity from renewable energy sources are solved. Students prepare in advance for the seminars by independently preparing presentations on pre-set topics. The exam is conducted in writing, considering the work of students during the semester.

SM12992 Technology and audit in the construction of renewable energy facilities

ECTS credits: 3 **Weekly classes**: 2l + 2s + 0lab + 0pr
Assessment: exam **Type of exam**: written and oral
Departments involved:
Department of Electrical Power Engineering. Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Konstantin Georgiev Koev, MEng, PhD, Dept. of Electrical Power Engineering, tel.: +359 82 888 661, E-mail: kkoev@uni-ruse.bg
Assoc. Prof. Kiril Aleksandrov Sirakov, MEng, PhD, Dept. of Electrical Power Engineering, tel.:+359 82 888 364, E-mail: csirakov@uni-ruse.bg
Abstract:
The aim of the learning is the students to improve some knowledge and practice on doing of the technology processes and controlling by construction of renewable energy installations.
Course content:
Object and subject of research, purpose and problems on construction of renewable energy installations. Energy efficiency construction solutions. Architecture of building wals covering systems. Thermophysical characteristics of the building covering elements. Materials in constructions of renewable energy installations. Energy characteristics of objects. Indicators for energy consumption. Determination of energy characteristics building classification. Building certification for energy efficiency. Principles and sequence for certification. Audit of building certification process. Energy efficiency investigation of buildings and installations. Sequence of sertificate issuance for individuals performing building certification and investigation for energy efficiency. Control of building certification process.
Teaching and assessment:
The lection's material is presented by present multimedia presentation techniques. The seminary exercises follow the lectures. The current oversight is being realized with examining the students before the particular exercise and at the end when they have to answering the questions and guesting the solves of real problems. The exam is conducted through written composing of questions the lectures' material. There is also oral exam on some of the main problems of the subject.

SM17870 Normative base and project management

ECTS credits: 3 **Weekly classes:** 2l+ 2s+0lab+ 0pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Electrical Power Engineering, Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Orlin Petrov, Department of Electrical Power Engineering, Phone: (+359 82) 888 455,
E-mail: opetrov@uni-ruse.bg.
Assoc. Prof. Anka Krasteva, Department of Electrical Power Engineering, Phone: (+359 82) 888 301,
E-mail: akrasteva@uni-ruse.bg
Annotation:
The aim of the course is to build students' knowledge of the regulatory framework and its application in developing the Electrical part of investment projects. Students are also trained in basic project management skills.
All regulatory acts concerning design are reviewed. Emphasis is placed on specific and important aspects in the application of regulatory acts. Particular attention is paid to the systematic verification of the relevance of a given regulatory act. Detailed instructions are given for the preparation of all elements of an investment project in the Electrical part. Specific regulatory acts for some special electrical systems are reviewed.
The course is based on knowledge acquired by students from bachelor's courses in the field of "Electrical Engineering, Electronics and Automation" and from the current master's course.
Course syllabus:
Use of the Spatial Planning Act. Normative documents and standards concerning lighting systems. Normative documents concerning the design of electrical systems. Normative documents concerning energy efficiency. Normative documents concerning electrical products. Content of an investment project. Algorithm for the development and coordination of investment projects.
Teaching and learning methods:
The training in the discipline is carried out through lectures and seminars, based on classical pedagogical forms. A multimedia projector (display) and specialized software are used for all topics. Students prepare for the seminars using methodological materials. The form of knowledge testing is written, taking into account the results of individual work. The written exam develops theoretical questions from the lecture material.

SM12919 Master thesis

ECTS credits: 15 **Weekly workload**: 0l + 0s + 0lab + 0pr
Assessment: official defence **Type of exam**: oral
Departments involved:
Department of Electrical Power Engineering
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Supervisor.
Abstract:
The subject of the thesis Is the students who all the semesters graduated to evidence knowledge and skills learned in all the studies prior and presented these into developing the thesis of the field of renewable energy sources and technologies and its public defence.
Course content:
Choice of thesis theme. Compilation of the thesis tasks, program and schedule. Compilation and presents information by literature sources researching, the theoretical topics concerning to the thesis. Choice and use of the present efficiency project and research methods to solve the thesis problem. Present the results, analysis, conclusions and recommendations. Formatting, printing and binding of the thesis. Giving the thesis to the supervisor, permit to thesis defence by chief of the department. Reviewing the thesis and defence of it.
Teaching and assessment:
The student choice thesis theme alone and working independently asking for advices the supervisor.
The student data acquisition, choices methods and solves the thesis problem by working in the university or in others libraries, computers halls, laboratories, manufactures. The supervisor gives advices to the student and he estimates the completeness of the thesis if all the tasks are solved. The chief of department gives permit to defence the finished thesis only.
The thesis is defend on the Examining Committee and it evaluates two rates – of the develop quality and of the defence. The thesis rate by the reviewer is reported too.

POSTGRADUATE STUDIES IN ELECTRONICS

PROFESSIONAL STANDARDS OF A MASTER IN

ELECTRONICS

Degree course: **Electronics**
Degree awarded: **Master of Engineering in Electronics**
Professional Qualification: **Electronics Engineer (MEng)**
Duration: **1 years (2 terms)**

The main goal of the Master's degree in Electronics is to prepare highly-qualified electronics engineers.

The professional suitability of a Master of Engineering in Electronics involves the ability to carry out investigations; to design, assemble and utilize; to perform manufacturing, technological, company and service activities; to do research and teach in the field of Electronics in view of their application in the public and private sectors, industry, agriculture, transport, banking, health care, environment protection, education, science, etc.
The Masters of Electronics can successfully work as managers of research teams, design and technological groups, divisions in the marketing and service sector; organizers and managers in the industrial sphere; government officials; lecturers in the field of higher education and so on, in the above-mentioned spheres. They can also continue their education as PhD students.

A Master of Engineering in Electronics should possess professional expertise and considerable linguistic competence. His/her education should be based on:

Teaching should be build on the basis of the professional preparation in the field of electronics and its application. The courses are devided to two parts:

- **Compulsary courses,** involving studying of Application of electronic technologyes in manufacturing, Sensors and actuators, Automotive Electronics, Applied Electronics for Agriculture, Telecommunication Engineering, Electronic devices for control of renewable energy sources, Biomedical Engineering, Nuclear electronics, Electronic System for Environment Control Marketing, Маркетинг, Automatic electrical drivers.
- **Compulsory choosen courses,** devided in two groups that include studying of Theory of Experiments, Technology Practice and Research Work, English for Specific Purposes.

A Master of Engineering in Electronics should be able:

- to identify and present his/her own solutions to problems in the field of Electronics;
- to apply creatively in practice the acquired knowledge;
- to adopt a complex technical and economical approach and use modern methods and tools when solving engineering tasks.

A Master of Engineering in Electronics should also possess the following job- specific skills:

- to create, develop and maintain modern electronic systems;
- to expand the functionality of modern electronic systems;
- to develop, adapt and implement up-to-date electronic devices and systems in different fields of everyday life - industry, science, trade, health care, education, banking, etc.
- to be able to take part in research activities.
- to be able to carry out complex technical and economical surveys and apply modern methods and tools for solving engineering tasks.
- to be able to investigate, exploit, maintain and manage small and medium-sized companies, as well as to be able to organize and manage his/her own business in the field of electronics.

CURRICULUM
of the Master's degree course in
ELECTRONICS

Code	*First term*	*ECTS*	*Code*	*Second term*	*ECTS*
	Compulsory subjects			**Compulsory subjects**	
SM17784	Application of electronic technologies in manufacturing	4	SM17790	Biomedical Engineering	3
SM17785	Sensors and actuators	4	SM17791	Nuclear electronics	3
SM17786	Automotive Electronics	4	SM17792	Electronic System for Environment Control	3
SM17787	Applied Electronics for Agriculture	4	SM16339	Marketing	2
SM17802	Telecommunication Engineering	4	SM17793	Automated Electrical Drives	2
SM17789	Electronic devices for control of renewable energy sources	4			
SM17803	Industrial Electronic systems	2			
	Compulsory optional subjects			**Compulsory optional subjects**	
SM17795	Theory of Experiments	4	SM17794	Technology Practice and Research Work	2
SM12941	English for Specific Purposes - 1	4	SM12948	English for Specific Purposes - 2	2
				Final Project	
			SM17772	Master thesis	15
	Total for the term:	***30***		***Total for the term:***	***30***

Total for the degree course: 60 ECTS credits

SM17784 Application of Electronic Technologies in Manufacturing

ECTS credits: 4 **Workload per week:** 1l + 0 s + 0 lab +2 pr
Assessment: CA **Type of exam:** written
Department involved:
Department of Automatics and Electronics (AE)
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc.Prof. Seher Kadirova, PhD, Dept. of AE, tel.: +359 82 888 741, E-mail: skadirova@uni-ruse.bg
Pr. Assist. Yavor Neykov, PhD, Dept. of AE, tel.: +359 82 888 772, E-mail: yneikov@uni-ruse.bg
Abstract:
The aim of the course is to introduce students to the application of the electronic technologies in manufacturing. The modern technologies on printed boards (PBs) manufacturing assembly with components are introduced. The peculiar attention is drawn to the applicable character of the course. Students are acquainted with the real manufacturing process and the technical facilities for fabricating of the electronic devices. The course content is based on the obtained knowledges from the courses in Electronic analogue circuits and systems, Theory of the electronic cirquits, Design, technology and reliability of the electronic equipment, Electronic design automation and other.
Course content:
Technologies for PBs fabrication. Equipment for PBs fabrication. Application of electronic technologies for PBs assembly. Equipment for PBs assembly. Preparation and adjustment of the technology equipment.
Teaching and assessment:
The lectures are two hours every other week. Laboratory exercises are 2 hours per week. A report is prepared after each laboratory exercise and is signed by the teaching assistant. The reports are used during the exam. The continuous assessment is carried out during the laboratory exercises and includes an input control, giving tasks and control for their completing. The final grade is formed on the base of the mark obtained from the practical exercises and the mark from the writing test at the end of the semester.

SM17785 Sensors and actuators

ECTS credits:4 **Workload per week:** 2l + 0 s + 0 lab +1 pr
Assessment: exam **Type of exam:** open test
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Anelia Vladimirova Manukova, PhD, DSc, Dept. of AE, tel.:+359 82 888 404,
E-mail: amanukova@uni-ruse.bg
Assoc. Prof. Seher Kadirova, PhD, Dept. of AE, tel.:+359 82 888 741,E-mail: skadirova@uni-ruse.bg
Annotation:
The course "Sensors and actuators" has the objective to acquaint the students with theoretical knowledge and skills in creation of electronic control systems based on advanced sensor technologies, and to use these knowledge to solve specific engineering problems. The practical exercises give practical skills for work with specialized instruments and devices. The course requires knowledge in the field of Electrical measurements, Analog, Digital and Microprocessor circuits, and other related disciplines.
Course syllabus:
Measurement sensors; Physical principles, characteristics and modeling of sensors; Sensor materials and technologies; Microsensors and nanoscale sensors; Sensors for registering objects and movement; Position, volume, and level sensors; Sensors for speed and acceleration; Force sensors; MEMS sensors; Pressure sensors. Flow sensors; Temperature sensors; Sensor interfaces; Noise characteristics of sensors and circuits; Actuators.
Teaching and assessment:
Specialized apparatus are used during the practical exercises. Students should be theoretically prepared for the practical exercises. The exam is an open test, which contains questions from lectures and practical exercises. The evaluation is performed by a point system.

SM17786 Automobile Electronics

ECTS credits: 4 **Weekly classes:** 2l+0s+0lab+1pr
Assessment: exam **Type of exam:** written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Nikolov Krastev, PhD, DSc, Dept. of Computer Systems and Technologies; tel.: +359 82 888 672, E-mail: geork@uni-ruse.bg
Abstract:
The Automobile Electronics course aims at acquainting the students with modern electronic devices built in the cars. Different types of electronic voltage regulators, electronic ignition systems as well as different electronic injection systems, electronic control and measuring tools are discussed. Emphasis is also put on microcomputer systems for engine and car control.
Course content:
General information about cars. Classification. Main mechanisms in cars. Common structure and principle of operation in the piston internal combustion engines. Electrical installations in cars. Microcomputer systems and technologies for engine control. Engine particularities defining the control system. Main tasks performed by the multifunctional systems for engine control. Components of the electronic systems for engine control. Specialised integrated circuits. Architecture of electronic systems for engine control. Control of ignition and fuel content. Trends in the development of modern complex engine control systems. Electronic car control systems. Systems for automatic gear switching. Anti-blocking brakes systems. Systems for automatic regulation.
Teaching and assessment:
The basic forms of training are direct contact hours and independent student work. Direct contact includes lectures and practical exercises. These make use of industrial models, electrical drives, and custom-developed trial-pieces in the laboratory practice. Classes are visualized with prospectuses and company literature. Practice sessions last 2 hours and are conducted every second week. Term validation is based on attendance and the final mark is based on the result of the written test and the practice. There is an oral testing if needed.

SM17787 Applied Electronics in Agriculture

ECTS credits: 4 **Weekly classes**: 2l + 0s + 0lab + 1pr
Assessment: exam **Type of exam**: written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Miroslav Dimitrov Mihaylov, PhD, Dept. of Agricultural Machinery, tel.: +359 82 888 441, E-mail: mmihaylov@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772; E-mail: yneikov@uni-ruse.bg
Abstract:
The compulsory course aims to acquaint students with the application of electronic circuits and printed circuit boards used in devices for control of a variety of technological processes in agriculture.
Course content:
Management systems in current farm industry – ecology, cost price, energy efficiency. Technological processes in agriculture and farming, in treatment and storage of definite produce. Methods and devices for data acquisition, processing of informational parameters and carrying out control signals in field and livestock farming, treatment and storage of the produce. Requirements on electronic circuits applicable in branches of farm industry. Applied electronic circuits in agricultural and livestock production. Applied electronic circuits in melioration, soil-cultivation machinery, automotive and tractor-driven farm equipment. Current scientific methods for settling problems in the automation of farm processes.
Teaching and assessment:
The lectures focus on the features of special processes in the field of farm industry and application of electronic circuits for their control. The practical exercises cover the research of particular schematic circuits with real technological parameters.

SM17802 Telecommunication Engineering

ECTS credits: 4 **Weekly classes:** 3l + 0s + 0lab + 2pr
Assessment: exam **Type of exam:** written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Anelia Vladimirova Manukova, PhD, DSc, Dept. of AE, tel.:+359 82 888 404,
E-mail: amanukova@uni-ruse.bg
Pr. Assist. Yavor Neykov, PhD, Dept. of AE, tel.: +359 82 888 772, E-mail: yneikov@uni-ruse.bg
Abstract:
The course aims at acquainting the students with the operating principles, main quantity relations, communication systems and devices structure, electronic schemes/units modelling and investigation methods for communication systems used for processing and translating of information signals at far distance.
Course content:
Messages, signals, communication channels – main characteristics. Environments and systems for transferring. Analogue multichannel consistence systems. Digital multichannel consistence systems. Data transfer. Commutation systems. Terminal devices. Communication networks. Radiotechnical mobile communication systems. Teletraffic systems.
Teaching and assessment:
The lecture topics give the main aspects of telecommunication technics. At the workshops the students acquire practical skills and habits to investigate and measure parameters of real modules, as well as to create mathematical models of real communication processes and systems by means of Matlab.

SM17789 Electronic devices for control of renewable energy sources

ECTS credits: 4 **Weekly classes**: 3l + 0s + 0lab + 1pr
Assessment: continuous assessment **Type of exam**: written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Boris Ivanov Evstatiev, DSc, Dept. of AE, tel.: +359 82 888 371, E-mail: bevstatiev@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772;
E-mail: yneikov@uni-ruse.bg
Abstract:
This course introduced the students with the modern electronic systems for control of renewable energy sources. Different control systems for PV modules, solar collectors for water heating and energy production, wind generators, small kinetic hydroelectric plants, biogas installations, geothermal
systems, are being examined.
Course content:
Energy resources on the Earth. Electronic control systems for PV modules. Electronic control systems for solar installations used for water heating. Electronic control systems for electric energy production, using the Sun heat. Electronic control systems for utilization of the wind energy. Electronic control systems for small kinetic hydroelectric plants. Electronic control systems for biogas production. Electronic control systems for geothermal energy utilization.
Teaching and assessment:
The students are being introduced with the theory of the lecture material, which additionally explained with appropriate practical examples. A multimedia projector is being used for better visualization. The practical exercises are 4 hours long. Modern development software for programming of controllers and microcontrollers, are being used. During the exercises every student has to solve a typical practical engineering problem for control of renewable energy sources. The final is being formed with two written test-papers.

SB17803 Industrial Electronic Systems

ECTS credits: 2 **Weekly classes:** 1l + 0s + 0lab + 1pr
Assessment: continuous assessment **Type of exam:** written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Aneliya Vladimirova Manukova, DSc, Dept. of AE, tel.:+359 82 888 404, E-mail: amanukova@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
The course "Industrial Electronic Systems" is compulsory in the Master's course and aims to introduce students to the theory and structure of different types of electronic control and automation systems in industry and industry. The lecture material covers research and scientific developments of electronic systems used in industry, based on dissertations and scientific publications of members of the department in the field of industrial electronics.
Course content:
Industrial systems, installations and facilities. Structuring principles and identification designations. Basic rules and classification of objects and class codes. Safety of machinery.
Building blocks and devices in industrial electronics. Electronic industrial control systems. Electronic machine vision systems. Industrial automation and machinery. Industrial robots. Measuring instruments and monitoring systems.
Teaching and assessment:
Lectures are given for 1 hour each week. Practical exercises are conducted for two hours each week using the frontal method. Measurements and setups are performed on industrial equipment in a simulated production environment. The current assessment is based on two written control papers.

SM17795 Theory of Experiment

ECTS credits: 4 **Weekly classes**: 0l + 0s + 0lab + 3pr
Assessment: continious assesssment **Type of exam**: written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Velizar Pavlov, MEng, PhD, Dept. of Applied Mathematics and Statistics, tel.: +359 82 888 466,
E-mail: vpavlov@uni-ruse.bg
Principal Assistant Maya Markova, PhD, Dept. of Applied Mathematics and Statistics,
tel.: +359 82 888 424, E-mail: mmarkova@uni-ruse.bg
Abstract:
This optional course includes the main methods for experiment planning in the field of engineering, processing and analysis of results. In this connection the objects are classified according to the number of control factors in three groups – with no control factors, with one control factor and with more than one control factors.
For the first group the methods of statistical estimation and of checking statistical hypothesis are considered. For the second and the third group the methods of single- and multi-factor regression and variances analysis are considered.
Course content:
Cybernetic approach in studying objects experimentally. The role of experiment in research. Types of experiments. Studying objects with no external influence. Studying single-factor objects. Single-factor regression analysis. Single-factor variances analysis. Studying multi-factor objects. Multi-factor regression analysis. Multi-factor variances analysis. Planning regression experiments. First degree plans. Second degree plans. Data processing in planned experiments. Planning experiments for variances analysis. Optimizing multi-factor experiments. Statistical optimization. Software products experimental data processing.
Teaching and assessment:
The lectures are 2 and 4 hours a week. The practice sessions take place in computer labs and the students work on the above topics under the lecturer’s supervision. The final mark includes a contribution from continuous assessment and the test from the practice sessions.

SM12941 English for Specific Purposes - 1

ECTS credits: 4 **Weekly classes**: 0l+ 0s + 0lab + 3pr
Assessment: continuous assessment **Type of exam**: written
Departments involved:
Department of Foreign Languages
Faculty of Mechanical & Manufacturing Engineering
Lecturers:
Snr Lecturer Elitsa Georgieva, PhD, Dept. of Foreign Languages, tel.:+359 82 888 532;
E-mail: edgeorgieva@uni-ruse.bg
Abstract:
English for Specific Purposes 1 aims to prepare the future Master engineers for work with scientific and technical literature and documentation in the corresponding subject area. The main task is the acquisition of knowledge about the structure of the English language, the main grammatical categories, intrinsic to the scientific and technical style (English for Specific Purposes), as well as communicative skills, connected with the use of the language for professional purposes.
Course content:
Revision and systematizing of the grammar and lexical material, studied in the Bachelor degree course. Diagram reading. Description of block diagrams and electrical circuits. Comparison and contrast. Asking for information. Guessing from the context. Linking ideas and facts. Component description. Description of processes and systems. Thematic groups. Comparison of sources. Giving advice. Sequence of events. Explanations. Reading graphs. Finding and using information. Adding information to text. Preparation of reports.
Teaching and assessment:
The classes focus on acquainting the students with the professional terminology by using special textbooks and media. The necessary language skills for work in professional settings are created via a variety of activities and exercises, which require active participation on the part of the students. Different authentic texts and other appropriate materials are used in class. Students are offered lessons in computer laboratories, in which multimedia learning packages and on-line materials are used according to the modern trends in foreign language teaching.

SM17790 Biomedical Engineering

ECTS credits: 3 **Weekly classes**: 3l + 0s + 0lab + 1pr
Assessment: exam **Type of exam**: written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Anelia Manukova-Marinova, PhD, DSc, Dept of AE, tel.: +359 82 888 404,
E-mail: amanukova@uni-ruse.bg
Abstract:
The course aims at acquainting the students with complex theoretical, methodological and apparatus problems in biomedical engineering. The optional course is studied during the last semester /for 10 weeks/.
Course content:
Classification and basic properties, characteristics and applications of medical electronic devices and systems. Biological effects of AC and DC on the human tissues. Diagnostic medical electronic devices (ECG, EEG, ultrasound, MRI). Therapeutic medical electronic devices (electro stimulators, defibrillators, pacemakers, HF therapy, microwave therapy, medical Ya-Nb lasers). Laboratory analysis medical electronic devices. Computerized systems for receiving, processing, interpreting and translating of medical signals. New tendencies in medical electronic devices and systems. Impact of ICT in medical electronics.Electrical signals with biological origin processing and analysis (basic parameters, denoising). Main principles of biomedical signals filtering. Data compression methods and tools.
Teaching and assessment:
Lectures give the main theoretical material, supported by some demonstrations of biomedical electronic devices. At the practical exercises students acquire skills and gain experience to work independently and creatively, to cope with different types of medical electronic devices and systems. The final mark is determined after an oral discussion.

SM17791 Nuclear electronics

ECTS credits: 3 **Weekly classes**: 3l + 0s + 0lab + 1pr
Assessment: exam **Type of exam**: written
Methodology management:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Department of AE, tel.: +359 82 888 741,
E-mail: skadirova@uni-ruse.bg
Abstract:
The aim of the course is to acquaint the students with the instruments and methods for detecting and measuring the basic parameters of the nuclear radiation, so that they can acquire not only theoretical knowledge but also practical experience in using the corresponding equipments. The course considers the basic concepts of nuclear physics and the various types of detectors for ionizing radiation. Special attention is paid to the methods and devices for transforming, selecting and recording detector signals and to the data processing. Particular methods, instruments and systems are discussed, which find application in nuclear-physics researches, medicine, ecology, industry and agriculture. The prerequisite is knowledge of physics, semiconductor devices, analog devices, digital devices and as well other.
Course content:
Interaction of radiation with matter. Radiation effects in electronic materials, electronic devices and electronic circuits. Increase of the radiation constancy of electronic circuitries and devices. Nuclear detectors. Electronic blocks in nuclear devices. Nuclear spectrometers. Radioisotope devices. Devices for measurement of low levels of nuclear radiation. Electronic systems for control and maintenance of the processes in nuclear reactors. Radiation dosimetry for internal exposure and radiation protection.
Teaching and assessment:
Classical pedagogic methods, multimedia and videos, and specialized software are used in the teaching process. The practical exercises follow the lectures and teach students to evaluate the basic parameters of the devices. The lectures are 3 hours per week and the laboratory exercises are 2 hours every other week. The practical exercises follow the lecture topics. The continuous assessment is held at the time for practice by oral examination, control and report defense. The continuous assessment during the exercises is done by oral discussions at the beginning of each exercise. Method of assessment: two hours written examination.

SM17792 Electronic System for Environment Control

ECTS credits: 2 **Weekly classes:** 3l + 0s + 0lab + 1pr
Assessment: continuous assessment **Type of exam:** written
Methodology management:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Tsvetelina Dimitrova Draganova, PhD, Dept. of AE, tel.: +359 82 888 668,
E-mail: cgeorgieva@uni-ruse.bg
Annotation:
The aim of the course “Automatic Control System for Environment Parameters” is to give students knowledge of methods and electronic systems for control of air quality, natural and waste water and soil. Subjects relating to risk management in hazardous environments, caused by industrial accidents and information systems related to evaluation of the characteristics of different sources of risk and risk management in hazardous environments will be considered.
Course content:
Composition and properties of the atmospheric air. Emissions. Methods and devices for air quality monitoring. Electronic systems for air monitoring. Methods and devices for hydrophysical, hydrochemical and hidrobyological water indices monitoring. Electronic systems for control of organic matter, dissolved oxygen and density contents of the sediment. Electronic systems for control of soil parameters. Risk management in hazardous environments caused by industrial accidents.
Teaching and assessment:
The subjects of the lectures introduce the main methods of quality air monitoring, natural and wastewater monitoring, soil pollution monitoring, methods, devices and information systems for risk management in hazardous environments caused by industrial accidents. The exercises follow the lectures material. The students have to be ready for the exercises and after their finishing they have to prepare a report. The rating of this subject is formed from results of a written exam.

SM16339 Marketing

ECTS credits: 2
Weekly classes: 3l+1s+0lab+0pr
Assessment: continuous assessment
Type of exam: written and oral
Departments involved:
Department of Economics
Faculty of Business and Management
Lecturers:
Assoc. Prof. Ljubomir Dimitrov Lyubenov, DSc, Dept of Economics, tel.: +359 82 888 347,
E-mail: LLyubenov@uni-ruse.bg
Abstract:
This compulsory course is studied during the last semester /for 10 weeks/ and it aims to give knowledge and skills to the future Masters for making accurate market estimation of the processes and phenomena in real conditions via the application of modern economic and marketing methods and approaches. The subject focuses on acquainting the students with the laps of market economy and their practical application in the respective market situation.
Course content:
Economic background of industry – starting business schemes, capital, long-term and short-term assets and company staff. Financial basis of industry – expenses for the company activities and production cost, prices and price forming in the conditions of a market functioning company, company profit and indicators for financial account analysis of the company. Marketing – marketing bases, tools of the marketing policy.
Teaching and assessment:
The lecture topics give the main aspects of the considered problems. At the seminars the students acquire practical skills and habits to independently solve problems in the respective subject. The term is validated according to the Inner rules of the University. Final assessment is done at the written exam, which is the final course procedure.

SM17793 Automatic Electrical Drives

ECTS credits: 3
Weekly classes: 2l+0s+0lab+2pr
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept of AE, tel.: +359 82 888 269, E-mail: msp@uni-ruse.bg
Pr. Assist. Nikolay Petkov Valov, MEng, PhD, Dept of AE, tel.:+359 82 888 269, E-mail: npvalov@uni-ruse.bg
Abstract:
The course is studied during the last semester which lasts 10 weeks. The Automatic electrical drives course focuses on the basics of electrical drives, as well as the means and methods of automation. It investigates power engineering of electrical drives, as well as a selection of electric motors. Course prerequisites include Physics, Electrical measurements, and Electrical Engineering. It is also linked to Electrical equipment of industrial processes, Applied electronics in agriculture, and the graduation thesis.
Course content:
Mechanics of an electrical drive. Electromechanics of DC and AC electrical drives. Special electrical drives.Power engineering of electrical drives. Automated electrical drives with static power converter. Frequency control of inductive electrical drives. Protection units in electrical drive systems.
Teaching and assessment:
The main forms of teaching include lectures and independent student work. The practice sessions make use of industrial models, electrical drives, and custom- developed trial-pieces in the laboratory practice sessions. Classes are visualized with brochures and other company literature. The number of hours allocated for practice is 2 every other week. Term validation is based on attendance. Final assessment is based on the result of the written exam and the practice.There is an oral testing if needed.

SM17794 Technological Practice and Research

ECTS credits: 2 **Weekly classes**: 0l + 0s + 0lab + 4pr
Assessment: oral exam **Type of exam**: oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Boris Ivanov Evstatiev, DSc, Depart. of AE, tel.: +359 82 888 371; E-mail: bevstatiev@uni-ruse.bg
Abstract:
The optional course Technological Practice and Research aims the practical implementation of individual assignments for consolidating students' knowledge. The training focuses on work with real technical devices – contactors, PIC processors, microprocessor systems, EPROM, one-chip microprocessor systems, work with software, used in practice, etc. The course is studied during the last semester /for 10 weeks/.
Course content:
Investigation of different schemes of connection of three-phase asynchronous electrical engines. Programming of EPROM for a microprocessor system. Base scheme of a microprocessor system. Tact sequels. Memory organization, assembly operators. Programming of a PIC processor. Programming with assembly language for PIC processors. Completion of individual tasks for programming with PIC processors. Exploration of the errors of digital figures by filtration of input data. Image recognition with TV camera. Work with software for image recognition. Individual development of an electronic item and work with Protel99.
Teaching and assessment:
The practical exercises are conducted in such a way that attention can be paid to the individual work of each student. Therefore, students receive personal independent assignments, whose completion is supervised by the teacher. The practical exercises and the research work are done on the basis of using specialized development devices and models, connected to the workplaces with personal computers. The final mark is formed after an oral exam.

SM12948 English for Specific Purposes - 2

ECTS credits: 2 **Weekly classes**: 0l + 0s + 0lab + 4pr
Assessment: oral exam **Type of exam**: written
Departments involved:
Department of Foreign Languages
Faculty of Mechanical & Manufacturing Engineering
Lecturers:
Snr Lecturer Elitsa Georgieva, PhD, Dept. of Foreign Languages, tel.:+359 82 888 532;
E-mail: edgeorgieva@uni-ruse.bg
Abstract:
English for Specific Purposes 2 aims to develop additional skills for communicating in professional settings. The topics include English for Specific Purposes and the students get acquainted with different genres of the scientific and technical style: description, explanation, lecture, summary, hypothesis, conclusion.
Course content:
Revision and systematizing of the grammar and lexical material, studied in the Bachelor degree course. Topic recognition. Recognition of similar meanings. Cause and result. Linking of ideas and facts. Graphs reading and description. Compound nouns. Expressing certainty. Technical terms. Expressing necessity. Skim reading. Description of purpose. Reading for details. Career plans. Job applications. Preparing a professional CV and letter of reference.
Teaching and assessment:
The classes focus on acquainting the students with the professional terminology by using special textbooks and media. The necessary language skills for work in professional setting are created via a variety of activities and exercises, which require active participation on the part of the students. Different authentic texts and other appropriate materials are used in class. Students are offered lessons in computer laboratories, in which multimedia learning packages and on-line materials are used according to the modern trends in foreign language teaching.

SM12949 Master thesis

ECTS credits: 15 **Weekly classes**: 0l + 0s + 0lab + 0pr
Assessment: defense **Type of exam:** oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Consultants:
All lecturers from the Department of AE
Abstract:
The Master thesis is a main part of the Master's degree course in Electronics. Master thesis is performed under the supervision of a scientific advisor, and if necessary, a scientific consultant. The aim of the Master thesis is to demonstrate the students' abilities to design and implement a creative project in the area of electronics, to demonstrate their ability to work independently, their initiative and professional competence. The Master thesis is presented and defended in front of the examination board.
Course content:
The Master thesis includes: title page; abstract; content; introduction; literature review and analysis of the existing solution; description of suggested solution; results, conclusions and discussion; references, and appendixes. The graphical part includes block and schematic diagrams, tables and graphs with the experimental results. The prototype development is the final stage from the design work.
Teaching and assessment:
A department of AE organizes collecting, approving and announcing of the suggested themes for Master thesis, the distribution of the students per themes and scientific advisors, the diploma practice organization, the supervision, review and presentation of the Master thesis. Weekly tutorials with the scientific advisors are provided for the students during which is monitored the process of the fulfillment of the given assignment. The student defends its Master thesis in front of the State examination board.

POSTGRADUATE STUDIES IN AUTOMOTIVE ELECTRONICS

PROFESSIONAL STANDARDS OF A MASTER IN

AUTOMOTIVE ELECTRONICS

Degree awarded: **Master of Engineering in Automotive Electronics**
Professional Qualification: **Automotive Electronics Engineer (MEng)**
Duration: **1 years (2 terms)**

This professional standard determines the professional purpose, the training and the most general skill requirements for an engineer with a Master degree in Automotive electronics, acquired after preceded bachelor degree in the same professional field.

The professional purpose of the Automotive electronics engineer with a Master degree is to perform study, design, exploitation, manufacturing, technology, service, research and development, scientific and academic work in the field of automotive electronics and electronic technologies and their applications in the automotive industry and the service works related to the automobiles' exploitation.

The engineer with a Master degree in Automotive electronics has to have a high-quality professional preparation, culture and well language abilities. Based on the above, his/her education has to be founded on:

- fundamental engineering knowledge in the professional field, including deep knowledge in the applied electronics, physics, electrical engineering, a number of general engineering and economic subjects, foreign languages and so on;
- specialized training, which includes knowledge in the field of automotive technique, information technologies, experiment methods, communication techniques and so on;
- specialized training corresponding to the students' interests, the market demands and with a view to possibilities and perspectives for the graduates' realization by means of the choice of a group of optional, elective subjects in the field of the automotive industry, services and so on.

The engineer with a Master degree in Automotive electronics has to possess the following general skills:

- to set and to be able to solve independently engineering tasks in the field of the automotive electronics and electronic technologies;
- to apply creatively the acquired knowledges in its practice;
- to carry out a complex technical and economical approach via applying current methods and means when solving the given tasks, using the most current information.

The engineer with a Master degree in Automotive electronics has to possess the following more specific skills:

- to create, develop and maintain current electronic and microprocessor systems;
- to create, adapt and introduce the current electronic technologies in there different application fields – automotive industry, service exploitation of the automobiles, trade, science and education;
- to develop and adapt current universal and specialized electronic systems by means of information technologies.

CAREER FIELDS

The graduates with a Master degree in Automotive electronics meet the educational standards of Bulgaria and European Union and are qualified for the following careers:

- managers and specialists in firms that produce electronic automotive systems;
- managers and specialists in firms that carry out services;
- designers in scientific establishments;
- academic and research workers at universities;
- specialists, advisers, experts and managers in public institutions and organizations, commercial firms and in private business.

CURRICULUM
of the Master's degree course in
AUTOMOTIVE ELECTRONICS

Code	*First term*	*ECTS*	*Code*	*Second term*	*ECTS*
	Compulsory subjects			**Compulsory subjects**	
SM17749	Sensors and actuators in cars	7	SM17753	Electronic systems for automobiles	3
SM17750	Communication technique and specialized automotive networks	5	SM17754	Control and Reliability of Automobile Electronic Systems	2
SM14160	Automotive Standards	4	SM17755	Electronic systems for drive control in vehicles	3
SM14161	Control systems for combustion engines	6	SM14168	Automotive diagnostics	3
SM14162	Car Control Systems	4	SM16339	Marketing	2
	Compulsory optional subjects			**Compulsory optional subjects**	
SM17751	Applied Electronics in Agricultural Machinery	4	SM17771	Electronic systems for car security and protection	2
SM17752	Electronic systems for car energy supply control from renewable energy sources	4	SM14170	Vehicle Traffic Safety and Organization	2
				Final Project	
			SM17757	Master thesis	15
	Total for the term:	***30***		***Total for the term:***	***30***

Total for the degree course: 60 ECTS credits

SM17749 Sensors and Actuators in Cars

ECST credits: 7
Workload per week:: 3 l + 0 s + 0 lab + 2 pr
Assessment: exam
Type of exam: written, open test
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Anelia Vladimirova Manukova, PhD, DSc, Dept. of AE, tel.:+359 82 888 404,
E-mail: amanukova@uni-ruse.bg
Assoc. Prof. Seher Kadirova, PhD, Dept. of AE, tel.:+359 82 888 741, E-mail: skadirova@ecs.uni-ruse.bg
Annotation:
The course "Sensors and actuators in cars" has the objective to acquaint the students with theoretical knowledge and skills in creation of electronic control systems based on advanced sensor technologies, and to use these knowledge to solve specific engineering problems. The practical exercises give practical skills for work with specialized instruments and devices. The course requires knowledge in the field of Electrical measurements, Analog, Digital and Microprocessor circuits, and other related disciplines.
Course syllabus:
Measurement sensors in cars; Physical principles, characteristics and modeling of sensors; Sensor materials and technologies; Microsensors and nanoscale sensors; Sensors for registering objects and movement; Position, volume, and level sensors; Sensors for speed and acceleration; Force sensors; MEMS sensors; Pressure sensors. Flow sensors; Temperature sensors; Sensor interfaces; Noise characteristics of sensors and circuits; Actuators for fuel injection in gasoline engines; Actuators for fuel injection in diesel engines; Actuators to regulate the pressure and dosage of fuel; Actuators for control of the engine operating modes of the; Actuators for control of the car transmission; Actuators in braking and steering systems, and suspension system of the car.
Teaching and learning methods:
Specialized apparatus are used during the practical exercises. Students should be theoretically prepared for the practical exercises. The exam is an open test, which contains questions from lectures and practical exercises. The evaluation is performed by a point system.

SM17750 Communication Technique and Specialized Automotive Networks

ECST credits: 5
Workload per week:: 2 l +0 s + 0 lab +2 pr
Assessment: continuous assignment
Type of exam: written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Boris Ivanov Evstatiev, DSc, Dept. of AE, tel.: +359 82 888 371, E-mail: bevstatiev@uni-ruse.bg
Annotation:
The compulsory course is students to gather theoretical knowledge about the basics, working methods and types of automotive communication equipment. The main learning tasks are studying of specific components and devices used for communication between different automotive systems: engine, control and security, coupe and comfort, infotainment, etc. and bringing in mind techniques for analysis and diagnosis of automotive technics.
Course syllabus:
Introduction to the automotive communication technique for exchange the information between different automotive systems: engine, control and security, coupe and comfort, infotainment, etc. Signals, the structure of messages, the structure of communication protocols in specialized buses LIN, CAN, FlexRay, MOST, OBD II. Diagnosis of test-car with tester and specialized software.
Teaching and learning methods:
This subject is taught during the first semester the duration of which is 15 weeks. The lectures are 2 hours per week. Visual aids are used such as presentation boards, charts, diagrams, etc. The students regularly get consultations over the learning material. The practical exercises are 2 hours per week. They are conducted together with lecture material. The final mark is formed on the basis of the marks from the two written tests.

SM14160 Automotive Standards

ECST credits: 4
Workload per week:: 2 l +1 s + 0 lab +0 pr
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of Engines and Vehicles
Faculty of Transport
Lecturers:
Assoc. Prof. Georgi Penchev Kadikyanov, MEng, PhD, Department of Engines and Vehicles,
tel. +359 82 888 526, E-mail: gkadikyanov@uni-ruse.bg
Abstract:
The subject treats topics related to performance of high quality production in car industry and particularly production of electronic control systems and managed actuators. Some questions of principle due to organization of quality insurances, structure and organizational relation between standardizing bodies have been considered. The main part of the questions is related to hierarchy of organizational activities in car industry and evolving from this a necessity of standardization control at all levels. Some questions are dedicated to tendencies toward unification of standardization requirements of continental and worldwide importance.
Course content:
Quality control. Standards and benefits from them. Kinds of standard. Standardization principles. European standardization system and its partners. Standardization in car production. Cars and environment. ISO 14000 series. Development of technical standard ISO/TS 16949. Standard OHSAS 18001. Ecological standards for vehicles. European regulations, regulations in USA, Japan and other countries. Impact of ecological requirements on manufacturing and combustion engine design. The role of electronics in engine and car control. CARS 2020: Action plan for competitive and sustainable European car industry. Tendencies in car industry development.
Teaching and assessment: Some multimedia presentations are used in lectures. Basic ground information from different standardization areas with examples from car industry regulatory is presented. Seminar exercises are led in groups of three hours covering five basic topics, related to final effect of car exploitation. Some material from conducted evaluation experiments is provided. The exam is written with oral discussion. The final mark is based on written exam assessment and answers' assessment from oral discussion.

SM14161 Control Systems for Combustion Engines

ECTS credits: 6
Weekly workload: 2l + 0s + 0lab + 2pr
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of Engines and Vehicles
Faculty of Transport
Lecturers:
Assoc. Prof. Georgi Penchev Kadikyanov, MEng, PhD, Department of Engines and Vehicles,
tel. +359 82 888 526, E-mail: gkadikyanov@uni-ruse.bg
Abstract:
Subject treats the structure of car combustion engines (CE), operational processes in them and their control systems. Petrol and diesel engines are treated separately as objects to control. Engine control systems are presented in tree groups: control of fuel supply, control of car ignition system, change of working body and systems for decrease emission of exhausted gases. In practical exercises, students are acquainted with devices and systems in combustion engines and their characteristics.
Course content:
Real process cycles in CE. Filling, compress, combustion, expansion and exhaust processes. Pointing and effective indices of car engine. Ecological indices of car engine. Work conditions and car engine characteristics. Fuel composition and fuel system of petrol and diesel car engines. CE as object to control. Control systems for fuel dosage and fuel-injection advance angle. Systems for pollution decrease from petrol and diesel car engines.
Teaching and assessment:
The teaching is implemented by lectures and practical exercises. The presentations are carried out by illustration of slides, samples, units, devices and details from real car engines. A written entry test is conducted at the beginning with 20 minutes duration over the topic of the exercise. In addition, five tests over the lectures' material are provided. At the exam, every student get an examination ticket with 10 questions from all over studied material.

SM14162 Car Control Systems

ECTS credits: 4
Weekly workload: 2l + 0s + 0lab + 1pr
Assessment: exam
Type of exam: written and oral
Departments involved:
Department of Engines and Vehicles
Faculty of Transport Engineering
Lecturers:
Assoc. Prof. Georgi Penchev Kadikyanov, MEng, PhD, Department of Engines and Vehicles,
tel. +359 82 888 526, E-mail: gkadikyanov@uni-ruse.bg
Abstract:
Subject „Car control systems" gives knowledge about structure and work principles of different control systems used in automotive engineering together with technical resources for their operation. Some methods for research of car control systems are discussed.
Course content: Control of continuously variable and automatic transmissions in automotive engineering. Brake properties improving systems. Automation of steering system. Suspension control. Car furnishing control.
Teaching and assessment:
The teaching is implemented by lectures and practical exercises. Lectures are presented by multimedia projector. A lot of illustrative material (posters, slides), samples, units, devices and details from real contemporary cars are used in practical exercises. The students are divided in small groups to analyze them with the help of the teacher. An oral entry discussion is conducted at the beginning of every exercise. The final mark is formed with written exam by a test with six open-answer questions and an oral discussion if necessary. For every answer the student is awarded with 10 points maximum, so final mark is formed relatively to a scale of 60 points upper limit.

SM17751 Applied Electronics in Agricultural Machinery

ECTS credits: 4
Weekly workload: 2 l + 0 s + 0 l + 1 pr
Assessment: continuous assessment
Type of exam: written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Miroslav Dimitrov Mihailov, MEng, PhD, Dept. of Agricultural Machinery, tel.: +359 82 888 441;
E-mail: mmihailov@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel.: +359 82 888 772;
E-mail: yneikov@uni-ruse.bg
Abstract:
The subject is meant to familiarize students with structure, characteristics and advantages of contemporary electronic circuits and control systems in agricultural machinery, together with methods for research of hardware and software provision of processes and unit automatization in agriculture. The subject helps to gain skills for diagnose and correct failures in process control circuit boards and other electronic equipment in tractors, harvesters and other farming machines. Students acquire competences for unaided development of technical projects for exploration and repair of electronic circuit boards in modern farm machinery.
Course content:
Basic methods and farming machines. Informational technologies in agriculture. Technical devices in precision farming. Electronic systems for driving and process control, calibration and diagnostic of modules, units and devices in tractors, harvesters and other farm equipment. Main principles and tasks in precision farming. Navigation systems in agricultural machinery and remote crops monitoring.
Teaching assessment:
The lectures have 2 hours duration every week and are focused on the features of electronic boards for farm machinery and process control. The practical exercises have duration 1 hour every other week and cover the research of particular schematic circuit on the task with real technological parameters. The output assessment of the practical work is carried out by oral report and discuss over results of implemented exercise assignments.

SM17752 Electronic Systems for Car Energy Supply Control from Renewable Energy Sources

ECTS credits: 4 **Weekly workload**: 2l + 0s + 0lab + 1pr
Assessment: continuous assessment **Type of exam**: written and oral
Departments involved:
Department of AE
Faculty of Electrical engineering, electronics and automatics
Lecturers:
Prof. Boris Ivanov Evstatiev, DSc, Dept. of AE, tel.: +359 82 888 371, E-mail: bevstatiev@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, MEng, PhD, Dept. of AE, tel. +359 82 888 772,
E-mail: yneikov@uni-ruse.bg
Abstract:
The subject get students acquainted with modern electronic systems for control of vehicle energy supply from renewable energy sources (RES). Control systems for electric car charge with photovoltaic (PV) and wind turbine installations, electronic devices for car battery charge and discharge, electronic circuits for fuel cells control, etc. have been treated.
Course content:
Classification of vehicles. Charging infrastructure. Electronic systems for accumulator charge and discharge. Electronic devices for fuel cells control. Electronic systems for control of photovoltaic charging stations. Electronic systems for control of wind energy utilization charging stations. Electronic systems for control of supercapacitors charge. Electronic systems for charge control and energy consumption from flywheels.
Teaching and assessment:
Students are acquainted with the theory from lectures, which is accompanied with suitable solution examples from real life and practice. For better illustration, a multimedia projector is used. Practical exercises are conducted frontally in 2 hours period every second week. Modern development tools for electronic circuit design and simulation analysis are used – MicroCap and Altium Designer. During exercises, every student independently does calculations, computer-aided research work and laboratory measurements. The final grade of the courses is formed after written tests in the middle and at the end of the semester.

SM17753 Electronic systems for automobiles

ECTS credits: 3 **Weekly workload:** 3l+0s+0lab+2pr
Assessment: examination **Type of exam:** written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Nikolov Krastev, DSc, Dept. of Computer Systems and Technologies; tel.: +359 82 888 672,
E-mail: geork@uni-ruse.bg
Abstract:
The compulsory course "Electronic systems for automobiles" aims at acquainting the students with the modern electronic devices built in the cars. Different types of electronic voltage regulators, electronic ignition systems as well as different electronic injection systems, electronic control and measuring tools are discussed. Emphasis is also put on microcomputer systems for engine and car control.
Course content:
Electrical installations in cars. Microcomputer systems and technologies for engine control. Engine particularities defining the control system. Main tasks performed by the multifunctional systems for engine control. Components of the electronic systems for engine control. Specialised integrated circuits. Architecture of electronic systems for engine control. Control of ignition and fuel content. Trends in the development of modern complex engine control systems. Electronic car control systems. Systems for automatic gear switching. Anti-blocking brakes systems. Systems for automatic regulation.
Teaching and assessment:
The basic forms of training are an auditory and an independent students' work. Auditory work includes lectures and practice. It is used industrial models, electrical drive, and particularly developed trial-pieces in the laboratory practice. Classes are visualized with prospectus and company literature. Practice is attended 2 hours per 2 weeks. Attestation is given when all the lessons are being attended too. Final mark forms from the written exam's result and the practice. There is an oral testing if needed.

SM17754 Control and Reliability of Automobile Electronic Systems

ECTS credits: 2 **Weekly classes:** 3l + 0s + 0lab + 2pr
Assessment: exam **Type of exam:** written and oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Seher Yusnieva Kadirova, PhD, Dept. of AE, tel.: +359 82 888 741, E-mail: skadirova@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel. : +359 82 888 772,
E-mail: yneikov@ecs.uni-ruse.bg
Abstract:
The course aims to provide to students knowledge in the design of automotive electronics, the impact of major types of disturbances, calculation of the reliability of electronic equipment and specifics of manufacturing processes for the production, by using methodologies for calculating of different regimes, structural elements of each electronic module as well as PCB design by solving practical problems.
Course content:
Operating conditions and classification of impacts on the design of automotive electronic systems. Effects of vibration, temperature, moisture and dirt on automotive electronic systems. Origin, method of expression, assessment methods remedies. Control and reliability of power systems in automobiles. Control and reliability of systems for comfort and protection of the automobiles. Production technology of automotive electronic systems and documentation.
Teaching and assessment:
The basic knowledge on the subject is acquired through lectures, which are presented in the classic version. Practical exercises reinforce the lecture material by work on models, real objects and solving practical problems. The final grade is formed on the basis of assessments of the two tests in the middle and end of the semester. After presenting the last test the final grade is given after a talk with the students.

SM17755 Electronic systems for drive control in vehicles

ECTS credits: 3 **Workload per week:** 3 l + 0 s + 0 lab + 2 pr
Assessment: exam **Type of exam:** open test
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Anelia Vladimirova Manukova, DSc, Dept. of AE, tel.: +359 82 888 404, E-mail: amanukova@uni-ruse.bg
Kamen Krastev, PhD, SIVICO Ltd., Rousse
Tzvetomir Gotzov, MEng., Expres Service Ltd., Rousse
Annotation:
The course "Electronic systems for drive control in vehicles" is basic for education of engineers in car electronics. The subject is compulsory in II semester of Master degree in Automobile electronics and aims students to be acquainted with the main principles for drive control used in vehicles.
The goal is students to gather some theoretical knowledge and skills for design of electronic systems for drive control based on contemporary components and programming languages, to use this knowledge for solving particular problems in practice.
In the beginning of every exercise, the theory is discussed and continuous current assessment is carried out. In addition, instructions for practical part implementation are given. Practical exercises help students to assimilate and supplement their knowledge from lectures and develop their skills to work with special-purpose devices and equipment.
Course content:
The course "Electronic systems for drive control in vehicles" examines all variety of drives used in transport, AC and DC electric motors with their specificity and control methods. Particular questions on power supply sources for drives are considered along with specific drives of Curtis, Sevcon, Zapi. In the lectures principle circuit boards and algorithms for system control are scrutinized
Teaching and learning methods:
The practical exercises are conducted with the help of specialized equipment on the base of preliminary theoretical preparation. The exam is open test with questions from lectures and exercises. The final assessment is based on total points gained by student during the semester.

SM14168 Automotive diagnostics

ECTS credits: 3
Weekly workload: 3l + 0s + 0lab + 2pr
Assessment: exam
Type of exam: written
Department involved:
Department of Transport
Faculty of Transport
Lecturers:
Assoc. Prof. Mihail Parashkevov Milchev, MEng, PhD, Department of Transport, tel: +359 82 888 231
E-mail: mmilchev@uni-ruse.bg
Abstract:
The course aims to provide students with basic knowledge for the change in technical condition of the automobiles, methods and means for diagnosis of various systems of the automobile. Practical exercises create conditions for the acquisition of basic skills for different methods and tools for diagnosing individual systems in automobiles.
Course content:
Methods and means for diagnostics and maintenance of systems and units of automotive engineering. Alteration of the technical condition. Eligible parameters.
Teaching and assessment:
Lectures are conducted on classical scheme using multimedia projector for viewing videos, drawings. Also are used models and real objects. Practical exercises reinforce the material from the lectures with individual work on models, real objects and stands. The grade is based on the knowledge demonstrated during the exam and participation in laboratory exercises.

SM16339 Marketing

ECTS credits: 2
Weekly workload: 2l + 1s + 0lab + 0pr
Assessment: Exam
Type of the exam: Written and oral
Responsible department:
Department of Economics
Faculty of Business and Management
Lecturer:
Assoc. Prof. Lyubomir D. Lyubenov, DSc, Department of Economics, tel. +359 82 888 347,
E-mail: LLyubenov@uni-ruse.bg
Annotation:
The course aims at the formation of knowledge and skills of correct evaluation of processes and phenomena in real market conditions.
Course contents:
Student education: Basic concepts and definitions of marketing; Basic marketing concepts; Marketing environment; Marketing research; Marketing mix; Marketing Strategy - preparatory stage and proper; Product, Distribution, Communication and marketing policies.
Teaching and assessment:
The lectures are presented in a classical scheme and by using visual aids – slides and presentations, where necessary. The seminars are conducted by working out tests and practical assignments. The requirements for validating the semester are in line with the internal rules of Ruse University.

SM17771 Electronic systems for car security and protection

ECTS credits: 2 **Workload per week:** 2 l +0 s + 0 lab +1 pr
Assessment: flow test **Type of exam:** written
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Anelia Vladimirova Manukova, DSc, Dept. of AE, tel.: +359 82 888 404, E-mail: amanukova@uni-ruse.bg
Principal Assistant Yavor Branimirov Neikov, PhD, Dept. of AE, tel. : +359 82 888 772,
E-mail: yneikov@ecs.uni-ruse.bg
Annotation:
The compulsory course is students to gather theoretical knowledge about the basics, working methods and types of automotive security equipment. The main learning tasks are studying of specific components and devices used in electronic systems for active protection, passenger security etc. and bringing in mind techniques for analysis and diagnosis of automotive technics.
Course syllabus:
Introduction to the car security systems and protection. Principles of passive systems. ABS. Automatic light regulation. Radar measurement of the velocity and distance. Immobilizer. Navigation systems. Ultrasonic parking assistance systems.
Teaching and learning methods:
This subject is taught during the first semester the duration of which is 10 weeks. The lectures are 2 hours per week. Visual aids are used such as presentation boards, charts, diagrams, etc. The students regularly get consultations over the learning material. The practical exercises are 2 hours alternating per week. They are conducted together with lecture material. The final mark is formed on the basis of the marks from the two written tests.

SM14170 Vehicle Traffic Safety and Organization

ECTS credits: 2 **Weekly workload:** 2l+0s+0lab+1pr
Assessment: continuous assessment **Type of exam**: written
Departments involved:
Department of Transport
Faculty of Automotive and Transport Engineering
Lecturers:
Assoc. Prof. Daniel Atanasov Lyubenov, PhD, Tel:. +359 82 888 605, E-mail: dliubenov@uni-ruse.bg
Abstract:
The aim of the subject is to give the students knowledge on traffic safety problems, to study the estimation methods and traffic safety methods and measurements. The methods for traffic accidents reconstructions are presented in detail. Previous knowledge of mechanics, transportation infrastructure, vehicles and vehicle diagnostics is necessary. The subject is an essential contribution to the professional training of transport engineers.
Course contents:
Traffic safety problems. Structure and functions of the “Driver – Vehicle – Transport infrastructure - Environment” system. Psychophysical characteristics of the drivers. Vehicle safety - Active safety systems and Passive safety systems. Measures to improve traffic safety. Transport accidents. Methods for estimating traffic safety and transport risk. Traffic accidents expertise. Vehicle accident analysis and reconstruction methods.
Teaching and assessment:
Lectures are conducted in a traditional form using appropriate technical aids. The laboratory exercises are practice-oriented. Assessment is based on tests. The final grade is calculated as an arithmetic evaluation of the current written tests.

SM17757 Master Thesis

ECTS credits: 15
Weekly classes: 0lec+0sem+0labs+0pr
Assessment: defense
Type of exam: oral
Departments involved:
Department of AE
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Lecturers from the Department of AE and experts in the field of electronics.
Abstract:
The Master Thesis is independent creative solution of an engineering problem, developed under the supervision of a director of studies, but in case of need – by an expert and a scientific adviser. It targets demonstration of knowledge and skills gained by students during their studies. It provides the following opportunities to the students completing master's degree course: to demonstrate their abilities to plan and implement a considerable and original projects in the field of electronics and microelectronics; to demonstrate self-dependent work, initiative and professional competency. The project has to be presented and defended in front of a State Board of Examiners.
Course content:
The Master Thesis consists of a written explanatory note on calculations that comprises references and analyses of existing solutions to the problem, description of suggested solution (used methods for design, calculations, etc.), explanations and conclusions. The graphical part includes block and structural diagrams, principle electrical circuits, flow-charts, graphics presenting the tests' results and programs. During the thesis defense, the students have to demonstrate the work of a device model, prototype or applied software.
Teaching and assessment:
The department of AE provides collecting, confirming and announcing of theses subject proposals; the distribution of the students per subject and scientific advisers for each of them; the diploma practice organization; the supervision, review and public defense of the Master Theses. The students have weekly tutorials with their supervisors, where the fulfillment of the given assignmentc is monitored.
The graduate student defends his Master Thesis project in front of State Board of Examiners, which assesses the project and the student's defense with two separate grades.

POSTGRADUATE STUDIES IN AUTOMATICS AND COMPUTER SYSTEMS FOR AUTOMATION

PROFESSIONAL STANDARDS OF A MASTER IN

AUTOMATICS AND COMPUTER SYSTEMS FOR AUTOMATION

SUBGECT: **AUTOMATICS AND COMPUTER SYSTEMS FOR AUTOMATION**
Educational Degree: **Master**
Professional Qualification: **Automatics Engineer**
Term of education: **1 year (2 terms)**

1. Qualification - master-engineer in Automatics.

The main goal of training in the subject “Automatics and computer systems for automation” is to prepare highly qualified, wide profiled specialists with solid general technical skills and enhanced knowledge of automatics and modern information and control systems. The speciality meets the specific needs in different fields like the industry, communications, transport, ecology, agriculture and follows the dynamics of their development.

2. General and special skills.

A Master in “Automatics and computer systems for automation” obtains the following knowledge skills:

- Fundamental, general technical and basic for the specialty knowledge in higher mathematics, physics, programming, electrical engineering, electronics, technical mechanics, control theory, electrical measurements, pulse, digital and analog circuitry, computer graphics, information technology and technologies, elements and systems for automatic control and automation of technological processes, sensor technology and intelligent sensors and systems, signal and data processing, system identification, control of electromechanical systems and automated electric drive systems, design of control systems for technological objects, computer control systems and industrial networks in computer control systems, experimental theory, etc.;
- Specialized knowledge of modern automatic control systems, computer systems for automation of technological processes, computer systems for distributed control, building automation systems, sensor networks, automatic control and management in environmental systems and other specialty-specific knowledge.

3. General and special skills.

A Master in “Automatics and computer systems for automation” obtains general and special skills to solve engineering, scientific, educational and management problems in the fields connected with the subject.

4. Career opportunities.

The wide profiled qualification and the profound knowledge in the field of automatics, information and control systems gives the opportunity to the masters to successfully implements themselves in different areas of the economy in:

- firms and enterprises as designers and industrial engineers for automation;
- firms and enterprises with special measurement and control system departments, power sections, measurement and control system labs and quality control labs;
- small and medium enterprises as test and implementation engineers of automation systems;
- industrial enterprises as operators of automation systems;
- industrial enterprises as managing engineers of production workshops.

CURRICULUM

of the Master's degree course in

AUTOMATICS AND COMPUTER SYSTEMS AUTOMATION

Code	*First term*	*ECTS*	*Code*	*Second term*	*ECTS*
S00309	Robust Control	8	S00316	Intelligent systems	5
S00312	Embedded control systems	5	S00328	Theory of Experiment	4
S00313	Computer Vision	8	SM14488	Building automation systems	3
S00716	Computer Control of Electromechanical systems	4	SM13976	Automatic control and environmental management systems	3
S00346	Distributed Computer Control Systems	5			
				Graduation	
			S00349	Master thesis	15
	Total for the term:	***30***		***Total for the term:***	***30***

Total for the degree course: 60 ECTS credits

S00309 Robust Control

ECTS credits: 8
Weekly classes: 3l + 0s + 0lab + 3pr
Assessment: exam
Type of exam: writing

Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation

Lecturers:
Assoc. Prof. Donka Ilieva Ivanova, PhD**,** Dept. of AE, tel. 082 888 266, e-mail: divanova@uni-ruse.bg

Abstract:
The course aims are to familiarize the students with modern robust and adaptive control systems theory and to develop practical skills for analysis and synthesis of such systems using MATLAB. Prerequisites to this course are the Control Theory courses of the Bachelor degree programme.

Course content:
Robust control systems. Uncertainty modelling. Robust stability and robust performance analysis. Design of H_∞ optimal controllers. μ-synthesis. Model-reference adaptive systems. Self-tuning regulators. Application of artificial neural networks and fuzzy logic in control systems.

Teaching and assessment:
The lectures present the theoretic aspects of the addressed problems and illustrate them with appropriate examples. The aim of the practical exercises is to teach the students to apply the acquired knowledge creatively. They are conducted with the aid of the MATLAB software system. The students' progress is checked in each exercise throughout the semester. The course ends with a written exam which consists of problem solving and question answering. In order to be allowed to take the exam the students have to attend all the exercises. The practical work mark is taken into consideration when forming the final course mark.

S00312 Embedded control systems

ECTS credits: 5
Weekly classes: 2l + 0s + 2lab + 0pr
Assessment: exam
Type of exam: written

Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation

Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel. 082 888 405, e-mail: daskalov@uni-ruse.bg
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept. of AE, tel. 082 888 379, e-mail: msp@uni-ruse.bg

Abstract:
The backgrounds of the Embedded Control Systems, based on PC, PLC and the platform-NI CompactRIO are considered in the course. The structure, the controlling algorithms and basic communications interfaces for that type of systems are presented in detail. It is put emphasis on programming by different software programs: DAQ Designer, LabVIEW, BridgeVIEW, etc. Input links: "Control Computer Systems –1 and 2", "Computer Measurement Systems", "Computer Networks" and "Information Industrial Systems".

Course content:
Industrial standards and interfaces for Embedded control systems. Embedded control systems structure and software. Algorithms for controlling. Real-time operating systems for Embedded control systems.

Teaching and assessment:
The available technical teaching devices are used during the lectures. Laboratory exercises are cycles organized and carried out at a teaching laboratory. Students are provided with user manuals for their teaching preparation. Before classes, the students' teaching backgrounds are examined. The results by experiments and software developments are entered in protocol. The final student assessment is formed on the basis of a collection of the exercises assessment and written exam assessment.

S00313 Computer Vision

ECTS credits: 8 **Weekly classes:** 3l + 0s + 0lab + 3pr
Assessment: exam **Type of exam:** written

Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation

Lecturers:
Prof. Plamen Daskalov, PhD, Department of AE, tel. 082 888 668, e-mail: daskalov@uni-ruse.bg
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept. of AE, tel. 082 888 379, e-mail: msp@uni-ruse.bg

Abstract:
The course aims to give the students working knowledge in modern computer vision systems, their basic characteristics, as well as the main stages of digital image processing. The students study different problems, related to acquisition and representation of images, image pre-processing, segmentation, image description, and image recognition.

Course content:
Computer vision structure. Acquisition and representation of images. Method and algorithms for binary and grayscale image processing. Segmentation and analysis of binary, grayscale and color images. Image recognition. Image recognition. Application of computer vision systems.

Teaching and assessment:
The lectures present the material as the main theory and illustrate it with appropriate example problems. The workshops are presented thematically. They are grouped in 3 basic subjects, which characterize certain stages of image processing. At workshops, the students use specialized program systems. The final mark is formed on the basis of the examination results and workshops.

S00716 Computer Control of Electromechanical systems

ECTS credits: 4 **Weekly classes:** 2l + 0s + 2lab + 0p
Assessment: continuous assessment **Type of exam:** writing

Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation

Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel. 082888668, e-mail: daskalov@uni-ruse.bg
Principal Assist. Nikolay Petkov Valov, PhD, Dept. of AE, tel. 082888266, e-mail: npvalov@uni-ruse.bg

Abstract:
Lectures teach the principles and architecture of computer systems for control of electric drives made with various complex components: PLC, specialized computers and complex systems. Discussed are issues related to protection, diagnosis and visualization parameters of CCES. The material of this course is thematically linked to the disciplines Electromechanical Systems-II, Computer Management Systems-II and Computer Control Systems-Course Project.

Course content: Major trends in computer control of electromechanical systems. Computer-based systems and systems with digital control of electromechanical devices. Industrial controllers for specialized systems. Modern approaches to the implementation of control algorithms for building CCES of DC and AC electric drives.

Teaching and assessment:
The workshops are conducted in specialized laboratories within the department, organized in cycles. For preparation of students using textbooks, methodical manuals, prospectus and literature. Before conducting the exercises the students are checked for their readiness and results of experiments are reflected in the reports. The evaluation is formed by the activities of students in practical classes and displayed knowledge of the written examination.

S00346 Distributed Computer Control Systems

ECTS credits: 5
Weekly classes: 2l + 0s + 2lab + 0pr
Assessment: exam
Type of exam: written

Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation

Lecturers:
Prof. Plamen Ivanov Daskalov, PhD**,** Dept. of AE, tel.: +359 82 888 668, e-mail: daskalov@uni-ruse.bg

Abstract:
The backgrounds of the Distributed Computer Control Systems (DCCS), based on PC and PLC are considered in the course. The DCCS structure and structure and basic communications interfaces of the local industrial networks are presented in detail. It puts emphasis on programming, control of distributed system resources and on creation of man-machine interfaces. Input links: "Control Computer Systems –1 and 2", "Computer Measurement Systems", “Computer Networks” and “Information Industrial Systems”.

Course content:
Architectures of the Distributed Computer Control Systems. Communication protocols in industrial local networks. Basic elements of the man-machine interface. Program elements for communication – OPC – servers. Control of the distributed resources of DCCS.

Teaching and assessment:
The available technical teaching devices are used during the lectures. Laboratory exercises are cycles organized and carried out at a teaching laboratory. Students are provided with user manuals for their teaching preparation. Before classes, the students' teaching backgrounds are examined. The results by experiments and software developments are entered in protocol. The final student assessment is formed on the base of a collection of the exercises assessment and written exam assessment.

S00316 Intelligent systems

ECTS credits: 5
Weekly classes: 4l + 0s + 0lab + 4pr
Assessment: exam
Type of exam: writing

Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation

Lecturers:
Assoc. Prof. Donka Ilieva Ivanova, PhD, Dept. of AE, tel. 082 888 266, e-mail: divanova@uni-ruse.bg
Asst. prof Stanislav Miroslavov Penchev, PhD, Dept. of AE, tel. 082 888 379, e-mail: msp@uni-ruse.bg

Abstract:
The main objective of the course “Intelligent Systems” is to acquaint the students with the basic problems, concepts and methodologies used in the artificial intelligent systems, as well as the areas of their application. Questions related to development of knowledge based systems, expert systems, pattern recognition systems, neural networks, genetic algorithms, fuzzy logic systems and their application are studied. The emphasis is over the different aspects for application of the intelligent systems.

Course content:
Basic characteristics of intelligent systems, knowledge based systems, expert systems, pattern recognition systems, neural networks, genetic algorithms, fuzzy logic systems.

Teaching and assessment:
The lectures include the basic theoretical problems in the subject area, which are illustrated with appropriate examples. Different problems connected with topics from the lectures are discussed in the practical exercises. The workshops are conducted in a computer room. The term is validated, if all the topics from the practical exercises are solved and the lessons are attended regularly. The final mark is formed on the basis of the written exam.

S00328 Theory of Experiment

ECTS credit: 4 **Weekly classes:** 3l + 0s + 0lab + 3pr
Assessment: exam **Type of exam:** written and oral
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel. 082888 668, e-mail: daskalov@uni-ruse.bg
Assoc. Prof. Donka Ilieva Ivanova, PhD, Dept. of AE, tel. 082888266, e-mail: divanova@uni-ruse.bg
Abstract:
The course includes the main methods for experiment planning in the field of engineering, processing and analysis of results. In this connection the objects are classified according to the number of control factors in three groups – with no control factors, with one control factor and with more than one control factors.
For the first group the methods of statistical estimation and of checking statistical hypotheses are considered. For the second and the third group the methods of single- and multi-factor regression and variances analysis are considered.
Course content:
Cybernetic approach in studying objects experimentally. The role of experiment in research. Types of experiments. Studying objects with no external influence. Studying single-factor objects. Single-factor regression analysis. Single-factor variances analysis. Studying multi-factor objects. Multi-factor regression analysis. Planning regression experiments. First degree plans. Second degree plans. Data processing in planned experiments. Optimizing multi-factor experiments. Statistical optimization. Software products experimental data processing.
Teaching and assessment:
The lectures follow the traditional ways of delivering. The workshops have investigative character. The exam is written and includes two questions and a problem.

SM14488 Building automation systems

ECTS credits: 3 **Weekly classes:** 3l + 0s + 0lab + 2pr
Assessment: exam **Type of exam:** writing
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Tsvetelina Georgieva, PhD, Department of AE, tel.: +35982888668, cgeorgieva@uni-ruse.bg
Assoc. Prof. Stanislav Penchev, PhD, Department of AE, tel.: +359 82 888379, msp@uni-ruse.bg
Abstract:
Course "Building automation systems" aims to develop students' knowledge of sensors, control devices and communication mechanisms and protocols in the design and construction of building automation systems. Main topics related to sensors and sensor systems in building automation, their interfaces and the processing of information in sensor systems are discussed. The curriculum of the course includes lectures and practical exercises on the main topics of the curriculum.
Course content:
Structure of building automation systems and standards for their construction. Sensors and sensor systems in building automation systems. Control devices in building automation systems. Modular controllers. Free programmable stations. Compact stations. Optimized system for energy monitoring and control. Optimized security solutions in buildings. Integrated building automation solutions. Energy and technical management system. Application of wireless sensor networks in the design of building automation systems.
Teaching and assessment:
The educational process is realized by lectures and practice work. The educational material is theoretically presented and demonstrated by proper example problems in the lectures. Practical exercises deepen their knowledge of lecture material and are conducted frontally. Students must be well-prepared for practical exercises. Students are assessed on the results of the current control over the semester, including practical exercises and exam.

SM13976 Automatic Control and Environmental Management Systems

ECTS credits: 3 **Weekly classes:** 3l + 0s + lab + 2pr
Assessment: continuous assessment **Type of exam:** writing

Department involved:
Department of Automatics and Electronics (AE)
Faculty of Electrical Engineering, Electronics and Automation

Lecturers:
Assoc. Prof. Tsvetelina Georgieva, PhD, Dept. of AE, tel.: 082 888 668, e-mail: cgeorgieva@uni-ruse.bg

Abstract:
Course "Automatic Control in ecological systems" aims to develop students' knowledge of the quality control environment. The following main topics related to energy production, greenhouse effect and global warming, pollution of natural waters, soil and air pollution with heavy metals and toxic organic compounds. Curriculum lectures and exercises related to the application of spectral analysis to characterize the main pollutants and remote sensing to measure key quality indicators of the environment.

Course content:
Air and Energy: chemistry of the stratosphere, air pollution. Toxic organic chemicals and heavy metals. Basic methods for the purification of polluted water. Metrology and environmental chemistry. Automated systems for environmental monitoring. Structure, features and functionalities. Instruments for the remote measurement of quality indicators of air, water and soil. Classification, basic types and parameters. Remote Sensing for automated grading of soil for the assessment of forests and forest resources, to explore the oceans and monitor environmental disasters.

Teaching and assessment:
The educational process is realized by lectures and practice work. The educational material is theoretically presented and demonstrated by proper example problems in the lectures. Lectures are delivered every week for the first eight weeks. In the workshops, the educational material understanding is controlled and skills for solving practical problems are developed. The workshops are conducted on a rotational principle in two specialized labs at the Departments of Automatics and Electronics. The final mark is formed by colloquium. The exam test includes 15 problems and/or theoretical questions from the educational material, and one practical task to be solved.

S00349 Master Thesis

ECTS credits: 15 **Weekly classes:** 0l+0s+0lab+0pr
Assessment: defense **Type of exam**: oral

Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation.

Lecturers:
Lecturers from the Department of Automatics and Electronics and expert engineers in the field of Computer control and Automation.

Abstract:
The Master Thesis is the final stage of the master's degree course in Automatics and Computer systems for Automation. It provides the following opportunities to the students completing the master's degree course: to demonstrate their abilities to plan and implement a considerable and original project in the field of computer control and automation; to demonstrate self-dependent work, initiative and professional competency. The Master Thesis is a solution to an engineering problem which is developed under the supervision of a scientific advisor. The aim is to enable the students to demonstrate the knowledge and skills gained during their education. The project has to be presented and defended in front of a state board of examiners.

Course content:
The Master Thesis consists of a written report that comprises references, ideas, existing solutions to the problem, analysis, calculations, descriptions and conclusions, a graphical part including the principal circuit diagrams of the elements and devices, block and structural diagrams, charts presenting the tests' results and a model or a prototype of system control made by the graduates.

Teaching and assessment:
The Department of Automatics and Electronics is responsible for the organization of the approval and announcement of the Master Thesis themes as well as for the supervision, review and public defense of the Master Thesis. The students have tutorials with their supervisors during the development of the Master Thesis. The State Board of Examiners assesses the project and the student's defense with two separate grades.

POSTGRADUATE STUDIES IN AUTOMATICS AND MECHATRONICS

PROFESSIONAL STANDARDS OF A MASTER IN

AUTOMATICS AND MECHATRONICS

SUBJECT: **AUTOMATICS AND MECHATRONICS**
Educational Degree: **Master**
Professional Qualification: **Engineer in Automatics and Mechatronics**
Term of education: **1 year (2 terms)**

1. Qualification - master-engineer in Automatics and Mechatronics.

The main goal of the Automatics and Mechatronics degree course is to prepare highly-qualified, wide-profiled specialists with solid general technical skills and extensive knowledge of automatics, modern information and control systems, as well as in specific mechatronic systems and control systems. The speciality meets the specific needs in different fields like industry, communications, transport, ecology, agriculture and follows the dynamics of their development.

2. General and special skills.

A Master in Automatics and Mechatronics obtains the following knowledge skills:

- Basic training in mathematics, physics, programming, electronics, electrotechnics, mechanics, control systems theory, electrical measurements, computer graphics, information technologies, mechatronic systems components, intelligent sensors and systems, data and signal processing, system identification, control of electromechanical systems and drives in Mechatronics, design of control systems and mechatronic systems, computer control systems, industrial networks etc.
- The special training includes obtaining of thorough knowledge of modern automatic control systems and mechatronic systems, CNC systems, interfacing, robotics, rapid prototyping, CAD systems in Mechatronics, intelligent systems and some other specific topics.

3. General and special skills.

A Master in Automatics and Mechatronics obtains general and special skills to solve engineering, scientific, educational and management problems in the fields connected with the subject.

4. Career opportunities.

The wide profiled qualification and the profound knowledge in the field of automatics, information and control systems, Mechatronics and control of mechatronic systems gives the opportunity to the master to successfully implement themselves as members and managers of engineering and scientific teams, as experts, industrial managers etc.

CURRICULUM
of the Master's degree course in
AUTOMATICS AND MECHATRONICS

Code	*First term*	*ECTS*	*Code*	*Second term*	*ECTS*
SM12995	Robust Control	8	SM13000	Intelligent Systems	5
SM12996	Embedded control systems	5	SM13001	Theory of Experiment	4
SM12997	Computer Vision	8	SM13002	Power Electronics	3
SM12998	Control of Mechatronic Systems	4	SM13003	Rapid Prototyping	3
SM12999	CNC systems	5			
				Graduation	
			SM12974	Master thesis	15
	Total for the term:	***30***		***Total for the term:***	***30***

Total for the degree course: 60 ECTS credits

SM12995 Robust Control

ECTS credits: 8 **Weekly classes:** 3l + 0s + 0lab + 3pr
Assessment: exam **Type of exam:** writing
Methodology management:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Donka Ilieva Ivanova, PhD**,** Dept. of AE**,** tel. 082888 266, e-mail: divanova @uni-ruse.bg
Annotation:
The course aims are to familiarize the students with modern robust and adaptive control systems theory and to develop practical skills for analysis and synthesis of such systems using MATLAB. Prerequisites to this course are the Control Theory courses of the Bachelor degree programme.
Syllabus contents:
Robust control systems. Uncertainty modelling. Robust stability and robust performance analysis. Design of H_∞ optimal controllers. μ -synthesis. Model-reference adaptive systems. Self-tuning regulators. Application of artificial neural networks and fuzzy logic in control systems.
Teaching and learning methods:
The lectures present the theoretic aspects of the addressed problems and illustrate them with appropriate examples. The aim of the practical exercises is to teach the students to apply the acquired knowledge creatively. They are conducted with the aid of the MATLAB software system. The students' progress is checked in each exercise throughout the semester. The course ends with a written exam which consists of problem solving and question answering. In order to be allowed to take the exam the students have to attend all the exercises. The practical work mark is taken into consideration when forming the final course mark.

SM12996 Embedded control systems

ECTS credits: 5 **Weekly classes:** 2l + 0s + 2lab + 0pr
Assessment: exam **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD**,** Dept. of AE, tel. 082 888 668, e-mail: daskalov@uni-ruse.bg
Abstract:
The backgrounds of the Embedded Control Systems, based on PC, PLC and the platform-NI CompactRIO are considered in the course. The structure, the controlling algorithms and basic communications interfaces for that type of systems are presented in details. It puts emphasis on programming by different software programs: DAQ Designer, LabVIEW, BridgeVIEW, etc. Input links: "Control Computer Systems –1 and 2", "Computer Measurement Systems", "Computer Networks" and "Information Industrial Systems".
Course content:
Industrial standards and interfaces for Embedded control systems. Embedded control systems structure and software. Algorithms for controlling. Real-time operating systems for Embedded control systems.
Teaching and assessment:
The available technical teaching devices are used during the lectures. Laboratory exercises are cycles organized and carried out at a teaching laboratory. Students are provided with user manuals for their teaching preparation. Before classes, the students' teaching backgrounds are examined. The results by experiments and software developments are entered in protocol. The final student assessment is formed on the basis of a collection of the exercises assessment and written exam assessment.

SM12997 Computer Vision

ECTS credits: 8 **Weekly classes:** 3l + 0s + 0lab + 3pr
Assessment: exam **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel. 082 888 668, e-mail: daskalov@uni-ruse.bg
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Dept. of AE, tel. 082 888 379, e-mail: msp@uni-ruse.bg
Abstract:
The course aims to give the students working knowledge in modern computer vision systems, their basic characteristics, as well as the main stages of digital image processing. The students study different problems, related to acquisition and representation of images, image pre-processing, segmentation, image description, and image recognition.
Course content:
Computer vision structure. Acquisition and representation of images. Method and algorithms for binary and grayscale image processing. Segmentation and analysis of binary, grayscale and color images. Image recognition. Image recognition. Application of computer vision systems.
Teaching and assessment:
The lectures present the material as the main theory and illustrate it with appropriate example problems. The workshops are presented thematically. They are grouped in 3 basic subjects, which characterize certain stages of image processing. At workshops, the students use specialized program systems. The final mark is formed on the basis of the examination results and workshops.

SM12998 Control of Mechatronic Systems

ECTS credits: 4 **Weekly classes:** 2l + 0s + 2lab + 0pr
Assessment: continuous assessment **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Dept. of AE, tel. 082 888 668, e-mail: daskalov@uni-ruse.bg
Principal Assist. Nikolay Petkov Valov, PhD, Dept. of AE, tel. 082 888 266, e-mail: npvalov@uni-ruse.bg
Abstract:
The course "Control of Mechatronic Systems" is a continuation of the chain of subjects from qualifications "Bachelor", as "Control of Electromechanical Systems", "Drives in Mechatronics Systems" and others. students learn to acquire knowledge in the field of mechatronics. The course operated mechatronic systems based on digital systems architecture standard and specialized software. Detailed examination of specialized systems in real time, programmable controllers and modular construction. Particular attention is paid to the ideology of management systems in mechatronics and monitoring of energy parameters.
Course content:
Deals with trends in the management of mechatronic systems, computer-based SCADA systems in mechatronics, computer control of mechatronic systems, speed, route and time of application software for control of mechatronic systems approaches in the implementation of algorithms for frequency converters used in mechatronic systems and industrial mechatronic systems based on the servos.
Teaching and assessment:
The flowing assessment takes place both during lectures and practice classes and is combined with the results from the colloquium. Point system for assessing students' knowledge is also an option. If a student gets a poor mark on the test, he should go in for a supplementary exam. Point system for assessing students' knowledge is also an option.

SM12999 CNC systems

ECTS credits: 5 **Weekly classes:** 2lec + 0sem + 2labs + 0pr
Assessment: exam **Type of exam:** written
Department involved:
Department of Machine Tools and Manufacturing,
Faculty of Mechanical and Manufacturing Engineering
Lecturers:
Assoc Prof. Dimityr Stefanov Dimitrov, PhD, Dept. MTM, Tel.: 082 888 653; e-mail: ddimitrov@uni-ruse.bg
Abstract:
The CNC systems subject has as a task to familiarize students with the CNC application in the control of machine tools, measuring and other machines, used in a manufacturing technology. The special features of control systems and the electric drive of coordinate controlled machines and their programming are studied. The CAD system SolidWorks and CAM package FeatureCAM for automated creation of CNC machines control programs are discussed. For mastering the subject, knowledge in electronic and electric drive. The subject has its application in design, exploitation and repair of CNC machines and design of technological processes for them.
Course content:
Construction arrangement of CNC machines. Programming of CNC lathe. Programming of a multi-turn center with CNC control. Microprogramming for CNC systems. Other machines with CNC control. Review of programming and technological possibilities of CAD/CAM systems. FeatureCAM-modules for milling and turning.
Teaching and assessment:
Lectures are accompanied with presentations and computer simulations. Practices are starting with discussion on the theme. Computer simulation programs are used in some of them. The practices on machine tools with CNC control are taken in a way that a student works on the lecturer's control and for others – it has a demonstrative nature.
Students have a free way to the computer lab. Except, they have student versions of SolidWorks CAD package and FeatureCAM package for designing their own tasks. The task includes a 3D model of a given part and automated development of a control program in FeatureCAM environment.

SM13000 Intelligent Systems

ECTS credits: 5 **Weekly classes:** 4l + 0s + 0lab + 4pr
Assessment: exam **Type of exam:** writing
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Donka Ilieva Ivanova, PhD, Department of Automatics and Electronics,
phone: +35982 888 266, E-mail: divanova@uni-ruse.bg
Assoc. Prof. Stanislav Miroslavov Penchev, PhD, Department of Automatics and Electronics,
phone:+35982 888 379, E-mail: msp@uni-ruse.bg
Abstract:
The main objective of the course "Intelligent Systems" is to acquaint the students with the basic problems, concepts and methodologies used in the artificial intelligent systems, as well as the areas of their application. Questions related to development of knowledge based systems, expert systems, pattern recognition systems, neural networks, genetic algorithms, fuzzy logic systems and their application are studied. The emphasis is over the different aspects for application of the intelligent systems.
Course content:
Basic characteristics of intelligent systems, knowledge based systems, expert systems, pattern recognition systems, neural networks, genetic algorithms, fuzzy logic systems.
Teaching and assessment:
The lectures include the basic theoretical problems in the subject area, which are illustrated with appropriate examples. Different problems connected with topics from the lectures are discussed in the practical exercises. The workshops are conducted in a computer room. The term is validated, if all the topics from the practical exercises are solved and the lessons are attended regularly. The final mark is formed on the basis of the written exam.

SM13001 Theory of Experiment

ECTS credit: 4 **Weekly classes:** 3l + 0s + 0lab + 3pr
Assessment: examination **Type of exam:** written and oral
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Plamen Ivanov Daskalov, PhD, Department of Automatics and Electronics,
phone +359 82 888 668, e-mail: daskalov@uni-ruse.bg
Assoc. Prof. Donka Ilieva Ivanova, MEng, PhD, Dept. of AE, tel.: +359 82 888 266,
E-mail: divanova@uni-ruse.bg
Abstract:
The course includes the main methods for experiment planning in the field of engineering, processing and analysis of results. In this connection the objects are classified according to the number of control factors in three groups – with no control factors, with one control factor and with more than one control factors.
For the first group the methods of statistical estimation and of checking statistical hypotheses are considered. For the second and the third group the methods of single- and multi-factor regression and variances analysis are considered.
Course content:
Cybernetic approach in studying objects experimentally. The role of experiment in research. Types of experiments. Studying objects with no external influence. Studying single-factor objects. Single-factor regression analysis. Single-factor variances analysis. Studying multi-factor objects. Multi-factor regression analysis. Planning regression experiments. First degree plans. Second degree plans. Data processing in planned experiments. Optimizing multi-factor experiments. Statistical optimization. Software products experimental data processing.
Teaching and assessment:
The lectures follow the traditional ways of delivering. The workshops have investigative character. The exam is written and includes two questions and a problem.

SM13002 Power Electronics

ECTS credits: 3 **Weekly classes:** 3l + 0s + 2lab + 0pr
Assessment: continuous assessment **Type of exam:** written
Department involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Boris Ivanov Evstatiev, DcS, Department of Automatics and Electronics, +359 82 888 772,
E-mail: bevstatiev@uni-ruse.bg
Assoc. Prof. Seher Yusnieva Kadirova, MEng, PhD**,** Dept. of Automatics and Electronics,
tel.: +359 82 888 516, E-mail: skadirova@ecs.uni-ruse.bg
Abstract:
The aim of the course "Power Electronics" is to acquaint students of specialty "Automatics and Mechatronics" with power semiconductor devices, their basic operating principles, basic operation principles and methods for analysis of electronic converters. The opportunities and ways of improving processes of switching converters are considered. Deals with rectifying circuits with different kinds of cargo, regulating the output voltage dc converters in variable. Via the practical exercises higher level knowledge and practical skills in the most important sections of the curriculum, and constant current control are achieved.
Course content:
General characteristics of power semiconductor elements. Power diodes. Power thyristors. Power bipolar transistors. Power field-effect transistors. Insulated gate bipolar transistor (IGBT). Power modules. Uncontrolled rectifiers. Controlled rectifiers. Control systems for rectifiers. Converters. DC / DC converters for renewable energy sources. Inverters. Power electronic converters.
Teaching and assessment:
It envisaged lectures to precede laboratories which aim is to enable students to be prepared for them. Practical exercises include PSpice simulation and laboratory part, during which are measured the parameters of laboratory models. At the beginning of the exercise the theoretical material should be discussed and given instructions to perform the practical part. The exercise ends with the formation of a protocol in which present and results are analyzed.

SM13003 Rapid Prototyping

ECTS credits: 3 **Weekly classes:** 3l + 0s + 0lab + 2pr
Assessment: exam **Type of exam:** written
Department involved:
Department of 'Machine Tools and Manufacturing',
Faculty of Mechanical and Manufacturing Engineering
Lecturers:
Assoc. Prof. Aleksandar Kirilov Ivanov, PhD, Dept. of MTM, tel. 082 888 714, e-mail: akivanov@uni-ruse.bg
Abstract:
The main goal of the course is to teach students in state of the art methods and constructions, technological capabilities, exploitation and application of the Rapid Prototyping Systems as part of mechanical engineering. With this course students acquire knowledge and skills for Rapid Tooling, and creating 3D CAD models, using state of the art 3D Scanning Systems.
Course content:
Lectures introduce state of the art Rapid Prototyping Technologies and Equipment. Advantages and disadvantages of the different techniques. Overview of the differences in the 3D modeling according to details: shape, configuration and dimensions, when different Rapid Prototyping methods are applied. Lectures give knowledge about future trends in exploitation, improvement and development of the Rapid Prototyping Systems.
Teaching and assessment:
Lectures are carried out in blocks of three classes every week, laboratory classes are carried out in blocks of two classes every week. The theoretical material from the lectures is applied during the laboratory classes. An output of all classes is a fully functioning prototype. The final grade is based on exams, covering the material from the lectures, as well as the laboratory classes.

SM12974 Master Thesis

ECTS credits: 15 **Weekly classes:** 0l+0s+0lab+0pr
Assessment: defense **Type of exam**: oral
Departments involved:
Department of Automatics and Electronics
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Lecturers from the Department of Automatics and Electronics
Abstract:
The Master thesis is one of the main components of the master's degree course in Automatics and mechatronics. The thesis is a solution of an engineering problem solved under the supervisory control of a teacher or consultant. The aim of the development is for graduates to demonstrate knowledge and skills acquired during their education. It guarantees that the graduates of "Master engineer" grade can demonstrate skills in the area of planning and realization of original projects in automatics and mechatronics, to work independently and to show initiative and professional competence. The master thesis must be presented and defended before the State Examination Commission.
Course content:
The Master Thesis consists of the state-of-the-art in the current area, detailed description of the proposed solution (used methods, developed algorithms, calculations etc.), inferences and conclusions. The Graphic part includes a block and structural diagrams, charts presenting the tests' results and a simulation model or a prototype made by the graduates. The graduates present their work or prototype before the State Examination Commission.
Teaching and assessment:
The Department of Automatics and Electronics is responsible for approval and announcement of master thesis themes, management of graduates, reviewing and issuing a public defense. The students developed their thesis under the guidance of a supervisor from the department or external specialists in automation. The State Examination Commission assesses the work and presentation of graduates with two final marks.

POSTGRADUATE STUDIES IN COMPUTER SYSTEMS AND NETWORKS

PROFESSIONAL STANDARDS OF A MASTER IN

COMPUTER SYSTEMS AND NETWORKS (CSN)

Degree course: **Computer Systems and Networks**
Degree awarded: **Master of Engineering in Computer Systems and Networks**
Professional Qualification: **Computer Engineer (MEng)**
Duration: **1 year (2 terms)**

The professional suitability of a Master of Engineering in Computer Systems and Networks is to carry out investigations; to design, assemble and utilize; to perform manufacturing, technological, company and service activities; to do research and teach in the field of Computer Systems and Networks in view of their application in the public and private sectors, industry, agriculture, transport, banking, health care, environment protection, education, science, etc.

A Master of Engineering in Computer Systems and Networks should possess professional expertise and considerable linguistic competence. His/her education should be based on:

- **complex fundamental and specialised** knowledge in areas such as modelling and simulation, distributed systems, administration of computer networks, routing protocols, corporate networks, fuzzy systems, distributed databases, programmable logic design, virtual instruments, specialized microprocessor systems;
- **additional training** which includes broadening of their foreign language proficiency;
- **carrying out specific scientific research** for the graduation thesis, according to the student's own interests, capabilities and development prospects.

A Master of Engineering should have the following general skills:

- to identify and present his/her own solutions to problems in the field of Computer Systems and Networks;
- to apply creatively in practice the acquired knowledge;
- to adopt a complex technical and economical approach and use modern methods and tools when solving an assigned engineering task.

A Master of Engineering should also possess the following job-specific skills:

- to create, develop and maintain modern microprocessor systems;
- to develop and adapt today's basic software applications for both general purpose and specialised computer systems;
- to expand the functional capabilities of modern computer systems and networks;
- to develop, adapt and implement up-to-date computer systems and networks in different fields of everyday life - industry, science, trade, education, banking, etc.

A Master of Engineering in Computer Systems and Networks should have a clear vision of his/her role and place in the Information Society and the underlying responsibilities.

CURRICULUM
of the Master's degree course in
COMPUTER SYSTEMS AND NETWORKS

Code	*First term*	*ECTS*	*Code*	*Second term*	*ECTS*
SM13007	Distributed Systems	5	SM14696	Cloud Computing	4
SM13009	Modelling and Simulation	5	SM13085	Specialized Microprocessor Systems	3
SM13006	Distributed Databases	5		***Elective courses (students select 2 courses)***	
SM13077	Network Infrastructure Administration	5	SM13083	Virtual Instruments	4
SM13078	Routing Protocols	5	SM14697	Programmable Logic Design	4
SM14695	Enterprise Networks	5	SM14698	Digital Audio and Video Content Processing Systems	4
			SM14699	Technologies and Methods for Software Testing	4
			SM14700	Computer Security and Defense	4
				Graduation	
			SM13015	Master Thesis	15
	Total for the term:	***30***		***Total for the term:***	***30***

Total for the degree course: 60 ECTS credits

SM13077 Distributed Systems

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ws
Assessment: exam **Type of exam:** written
Responsible department:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lectors:
Assoc. Prof. Milen Loukantchevsky, MEng, PhD, Dept. of CST, tel.: +359 82 888 674, Email: mil@ieee.org
Abstract:
The course main goal is to help students reach more deep understanding of basic principles and practical aspects of the distributed computer systems.
The basic structural components of the distributed systems are defined along with several fundamental models. The organization of the communications and interactions between distributed objects as well as control of the distributed resources and security are investigated.
Course content:
Main terms. Properties. Distributed systems structuring. Distributed models. Communications. Communication protocols between distributed objects. System clocks synchronization. Logical clocks. Naming, identification and addressing. Atomic actions. Distributed transactions. Distributed file system. Fault-tolerance. Distributed systems security and protection.
Teaching and assessment:
The lectures introduce main theoretical topics. Each group of lectures ends with conclusion of material and formulation of problems.
At the workshops simulations and real systems are used putting lectures to practice. Each workshop begins with formulation and analysis of problems. At the very end the students are asked to summarize in written form their results.
The information materials needed are given in electronic form to all of the students.

SM13009 Modelling and Simulation

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ws
Assessment: continuous assessment **Type of exam:** written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Tsvetozar Stefanov Georgiev, MEng, PhD, Dept. of CST, tel.: +359 82 888 827,
E-mail: TGeorgiev@ecs.uni-ruse.bg
Abstract:
The course objective is to give the necessary theoretic knowledge and practical skills to create models and simulate different systems including computer ones. Course prerequisites: Higher Mathematics, Discrete structures and modelling, Digital signal processing and Computer systems for control.
Course content:
Introduction to modelling and simulation. Technology for computer modelling. Mathematical formalization and abstract description in computer modelling. Automata description of systems. Functional modelling. Analytical modelling. Statistical modelling. Computer simulation of processes and systems.
Teaching and assessment:
At the lectures students are familiarised with the theoretic aspects of the main topics connected with modelling and simulation. At the practical sessions they work with specific environments for modelling and simulation. During the semester the students have two tests which contain practical exercises solved on PC and theoretical questions. The final mark is based on the marks of the two tests and the student's participation in the workshops.

SM13006 Distributed Databases

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ws
Assessment: exam **Type of exam:** written
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Milko Todorov Marinov, MEng, PhD, Dept. of CST, tel.: +359 82 888 356,
E-mail: MMarinov@ecs.uni-ruse.bg
Assoc. Prof. Irena Marinova Valova, MEng, PhD, Dept. of CST, tel.: +359 82 888 685,
E-mail: IValova@ecs.uni-ruse.bg
Abstract:
Distributed database system technology is one of the major recent developments in the field of database systems. The Distributed Databases course aims at studying of principles and practical aspects of current distributed database systems. Upon completion of this course the students should be able to: understand the role and importance of distributed DB in a software project; describe issues, principles, methods and architectures associated with distributed DB; undertake the development of a distributed database from a conceptual level, through logical design, performance analysis, and implementation, providing appropriate query.
Course content:
Introduction into distributed data processing. Distributed DBMS architecture. Distributed database design. Semantic data control. Query decomposition and data localization. Optimization of distributed queries. Introduction to transaction management. Distributed DBMS reliability.
Teaching and assessment:
The lecture topics provide the main theoretic aspects of the considered problems. The workshops are conducted in a computer lab. The students should independently solve, code and debug entirely or partially defined elements with the aid of a corresponding programming environment. Students' work is evaluated at each workshop. The exam includes a number of problems with a different degree of difficulty and a point system for evaluation. The final course mark is formed as an average of the workshop marks and the exam mark.

SM13077 Network Infrastructure Administration

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ws
Assessment: exam **Type of exam:** written
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Nikolov Krastev, MEng, PhD, DSc, Dept. of CST, tel.: +359 82 888 672,
E-mail: gkrastev@ecs.uni-ruse.bg
Abstract:
The course objective is to familiarize students with the modern trends in cable and wireless network infrastructure design. The course focuses on specialized IP modules for network infrastructure management, and it presents network solutions based on controllable network switches with options for configuration and management. It provides knowledge on specialized network infrastructures for monitoring and management. Special attention is paid to mobile Internet access.
Course content:
Cable network infrastructure design. Specialized IP modules for network infrastructure management. Development systems. Network functions. Network configuration. Network solutions based on controllable network switches with options for configuration and management. Network switch architecture constructed on the basis of RTL8309SB integrated circuit. Specialized network infrastructures for monitoring and management. Network infrastructure supply and protection. Network resources management software. Wireless network infrastructure design. Mobile Internet access. Analysis of the possibilities for mobile data exchange. Server response adaptation to mobile users. Electromagnetic compatibility in modern communications.
Teaching and assessment:
The lectures are 2-classes a week and provide basic knowledge on NIA. The practical sessions are conducted face-to-face in PC training rooms 4 classes a fortnight. Students are involved in practice-oriented tasks. The continuous assessment during the practice sessions is based on the results from the allotted individual tasks. The final assessment is a written exam conducted during the examination session. In addition to the lecture records students get a list of recommended literature to help them prepare for the exam.

SM13078 Routing protocols

ECTS credits: 5
Weekly classes: 2lec+0sem+0labs+2ws
Assessment:exam
Type of exam: written and oral
Department involved:
Department of Telecommunications,
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Valentinov Hristov, MEng, PhD, Dept. of Telecommunications tel.: +359 82 888 663,
E-mail: ghristov@uni-ruse.bg
Abstract:
The purpose of the course is to introduce the students to the specifics and characteristics of the routing protocols, used in IP networks – the most widely used and potentially the most interesting for the students type of networks. The main reasons for the complexity of the routing algorithms are also being revised - they are the coordination between the separate devices in the network, the congestion and others. The course introduces the two basic classes of routing protocols – routing protocols in autonomous network segments and routing protocols between autonomous network segments.
Course content:
Introduction to the theory of routing protocols. Structure of the routing tables. Routing protocols in autonomous network segments. Protocols for routing between autonomous network segments. Routing protocols for the next generation of IP networks.
Teaching and assessment:
The lectures are conducted 2 hours weekly, and the practical exercises are 4 hours every 2 weeks. The students are preparing for the exercises, using the recommended literature. For each exercise the students prepare and present to the teacher a report. The exam consists of written and oral parts.

SM14695 Enterprise Networks

ECTS credits: 5
Weekly classes: 2lec+0sem+0labs+2ws
Assessment: continuous assessment
Type of exam: written
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Georgi Valentinov Hristov, MEng, PhD, Dept. of Telecommunications tel.: +359 82 888 663,
E-mail: ghristov@uni-ruse.bg
Abstract:
The purpose of the course is the students to get into the specifics of the enterprise computer network infrastructure. Thorough study is made of Ethernet technologies based switches, hierarchical switched network design, STP support, security, VLANs. Under exploration are storage systems and networks(DAS, NAS, SAN, RAID, FC, iSCSI, FCoE) and their software, as well as data centres, regulations and compliancy, security, management, organization, exploitation and trends in the enterprise networks.
Course content:
Introduction to enterprise networks. Introduction to telecommunications networks. Broadband access technologies. Ethernet switch based enterprise LAN infrastructures. Storage Systems and networks. Data Centres. Security, Management, organization, exploitation and trends in the enterprise networks.
Teaching and assessment:
The lectures are conducted 3 hours weekly. The practical exercises are 3 hours weekly either. The students are preparing for the exercises, using the recommended literature. The exam is written, with test questions and tasks, case resolving, as well as with practical task in simulator.

SM13696 Cloud Computing

ECTS credits: 4 **Workload per week:** 3lec+0s+0lab+3ws
Assessment: exam **Type of exam:** written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Irena Marinova Valova, MEng, PhD, Dept. of CST, tel.: +359 82 888 685
E-mail: irena@ecs.uni-ruse.bg
Assoc. Prof. Milko Todorov Marinov, MEng, PhD, Dept. of CST, tel.: +359 82 888 356
E-mail: mmarinov@ecs.uni-ruse.bg
Assoc. Prof. Yordan Ivanov Kalmukov, MEng, PhD, Dept. of CST, tel.: +359 82 888 827
E-mail: jkalmukov@ecs.uni-ruse.bg
Abstract:
The course Cloud computing is an essential and compulsory in the curriculum for training of masters in Computer Systems and Networks and Computer Systems and Technologies. It covers a relatively new topic in the field of IT and aims to familiarize students with the development and basic principles of cloud computing and technologies, the main types of services, the management and architectural models. A special attention is paid to all issues concerning security and privacy in the cloud. Students will be introduced to a set of publicly available clouds and will be trained how of develop and deploy their own cloud applications.
Course content:
Cloud Technologies - basic characteristics and definitions stack of services, service-oriented architecture, communication between services, mechanisms to manage cloud resources, architectures, virtualization, privacy and security, public cloud solutions
Teaching and assessment:
The lectures are 30 hours per semester . The exercises are held in a computer lab in blocks of at least four hours per day. Each student or team of two students have to develop a small paper in the theme of the course. At the end of the semester each presented within 10 minutes their essay and receive assessment , which is part of the final grade.

SM13085 Specialized Microprocessor Systems

ECTS credits: 3 **Weekly classes**: 3lec+0sem+0labs+3ws
Assessment: continuous assessment **Type of exam:** written and oral
Department involved:
Department of Telecommunications
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Nina Vsileva Bencheva, MEng, PhD, Dept. of Telecommunications, tel.: +359 82 888 677,
E-mail: nbencheva@ecs.uni-ruse.bg
Abstract:
The Special Purpose Microprocessors course aims to familiarize the students with the composition of one of the most popular families of one-chip microcomputers RISC and the structure of its main representatives, with the CAD/CAT (Testing) systems for special purpose microprocessors based on one-chip microcomputers, as well as with their programming languages. The course deals with signal processors, industrial controllers and special purpose microprocessors based on them.
Course content:
One-chip microcomputers PIC16F87X. One-chip microcomputers for digital signal processing of analogue signals DSP TMS320C54X. Special purpose microprocessors for industrial application.
Teaching and assessment:
The lectures deal mainly with the design of the hardware while the seminars focus on the development of software for special purpose microprocessors based on one-chip microcomputers. The practical sessions are conducted in a computer room equipped with PIC, DSP and PLC development systems based on PC.

SM13083 Virtual Instruments

ECTS credits: 4 **Weekly classes:** 3lec+0sem+0labs+3ws
Assessment: exam **Type of exam:** written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Tsvetozar Stefanov Georgiev, MEng, PhD, Dept. of CST, tel.: +359 82 888 827,
E-mail: TGeorgiev@ecs.uni-ruse.bg
Principal Assistant Hovanes Mardiros Avakian, MEng, PhD, Dept. of CST, tel.: +359 82 888 674,
E-mail: HAvakian@ecs.uni-ruse.bg
Abstract:
The course aims to familiarise students with the modern tendencies in virtual instruments development. The architecture of virtual instruments, hardware and software environments for their constructing is also examined. Course prerequisite is the knowledge of the Modelling and Simulation.
Course content:
Architecture of virtual instruments. Devices for measurement, testing and automation. LabVIEW software environment for the development of virtual instruments. LabVIEW specialized modules. LabWindows/CVI software environment for the development of virtual instruments. Specialized library NI Measurement Studio for Microsoft Visual Studio for developing virtual instruments. Building virtual systems for measurements and automation.
Teaching and assessment:
At the lectures students are familiarised with the theoretic aspects of the architecture of the virtual instruments, hardware and software environments for their constructing. At the practical sessions they work with specific software environments for virtual instruments development. The course ends with a written and oral exam.

SM14697 Programmable Logic Design

ECTS credits: 4 **Weekly classes:** 3l+0s+0le+3ws
Assessment: exam **Type of exam:** written, oral
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Aneliya Stoyanova Ivanova, MEng, PhD, Dept. of CST, tel.: +359 82 888 827,
E-mail: AIvanova@ecs.uni-ruse.bg
Principal Assistant Nikolay Genkov Kostadinov, MEng, PhD, Dept. of CST, tel.: +359 82 888 674;
E-mail: NKostadinov@ecs.uni-ruse.bg
Assoc. Prof. Galina Ivanova Ivanova, MEng, PhD, Dept. of CST, tel.: +359 82 888 827;
E-mail: GIvanova@ecs.uni-ruse.bg
Abstract:
The course aims to introduce to the students the basic principles of digital systems design using programmable logic. Programmable logic families, device architectures, and programming technologies are covered in detail as well as design methodology, techniques, rules, and guidelines for implementing various digital systems with programmable devices. The students gain practical skills to operate with integrated environments for modelling, synthesis, simulation and configuration of digital systems.
Course content:
Programmable logic review. CPLD and FPGA. FPGA Architectures with Embedded Devices. Programming Technologies. Design Methodology for Programmable Devices. Design Techniques, Rules, and Guidelines. Embedded Processor-Based Design Flows. Simulation, Synthesis and Verification Design Tools. Future FPGA Developments. FPNA.
Teaching and assessment:
At the lectures students are familiarized with popular CPLD and FPGA families, device architectures, and programming technologies as well as methodology and techniques for programmable logic design. During the workshops the students use CAD systems, HDL and FPGA to design and implement various digital devises. The assessment mark is formed on the basis of the results of two tests on the lecture material.

SM14698 Digital Audio and Video Content Processing Systems

ECTS credits: 4 **Weekly workload**: 3lec+0sem+0labs+3ps
Assessment: exam **Type of exam**: written
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Lachezar Lazarov Yordanov, MEng, PhD, Dept. of CST, tel: 082 888 859,
e-mail: liordanov@ecs.uni-ruse.bg
Annotation:
The aim of the course is for students to acquire the theoretical knowledge and the practical implementation of the modern "pipeline" – reproduction-transformation-generation of audio/video content. The course acquaints students with the methodology, processing audio/video signals, as well as optimizing memory and its management in "realtime" environment. Mathematical models will be explored to help with transformations of video/audio datasets.
Course content:
Systems for processing of digital audio and video content – nature, terminology and basic requirements. Pipeline of processing, reproduction and content generation processes. Methods for processing video/audio signals. Mathematical models for performing transformations on video/audio data arrays. Algorithms for encoding and decoding audio/video.
Technology of teaching:
At the lectures the students are introduced theoretically with the theoretical and practical realization of a modern "pipeline" - reproduction - transformation - generation of audio/video content. Students are introduced to the methodology, processing audio/video signals, as well as optimizing memory and its management in "realtime" environment. During the practical exercises, they will become acquainted with algorithms for encoding and decoding of audio/video data (content), their weaknesses and limitations imposed by modern hardware.

SM14699 Technologies and Methods for Software Testing

ECTS credits: 4 **Weekly workload**: 3lec+0sem+0labs+3ps
Assessment: exam **Type of exam**: written
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Lachezar Lazarov Yordanov, MEng, PhD, Dept. of CST, tel: 082 888 859,
e-mail: liordanov@ecs.uni-ruse.bg
Annotation:
The aim of the discipline is to acquaint the students with the entire process of building software, focusing on the tools, with which he is supported-ideology of testing and its importance in a commercial software. Special attention will be given to the practical development of tests - the TDD (Test-driven development) method.
Course content:
Nature and benefits of testing software. Basic terminology. Methodology of testing (static and dynamic testing, white/black box model and visual testing). Scope of testing (unit, integration, system testing, component). Types of testing (regression, sanity, acceptance, security, alpha, beta). The process of testing (waterwall, agile). Automation of testing.
Technology of teaching:
The lectures include the theoretical introduction to the overall process of building the software, focusing on the tools, with which he is supported. They will learn about the ideology of testing and and its importance in a commercial software. Special attention will be given to the practical development of tests using the TDD (Test-driven development) method. During the exercises the students apply the knowledge obtained during the lectures, get acquainted with the test writing library. Apply the testing methods: unit testing and performance testing. Develope software using TDD method.

SM14700 Computer Security and Defense

ECTS credits: 4
Weekly classes: 3lec+0sem+0labs+3ws
Assessment: exam
Type of exam: written, oral
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Galina Ivanova Ivanova, MEng, PhD, Department of CST, tel.: 888 827,
E-mail: givanova@ecs.uni-ruse.bg
Principal Assistant Pavel Stoyanov Zlatarov, MEng, PhD, Dept.of CST, E-mail: pzlatarov@uni-ruse.bg
Abstract:
The objective of the Computer Security and Defense course is to familiarise the students with the current trends and security standards of computer systems and networks and the data they process.
Course content:
An Introduction to Computer Security. Computer Security Policies. International Standards for Computer Security. Risk Management. Threat Management. Types of Attacks. Cybercrime. User Access Management. Digital Identity and Data Confidentiality. Network Security. Internet Security. Wireless Network Security. Defense methods.
Teaching and assessment:
The lecture hall is equipped with an interactive presentation system. Workshops are in a computer lab equipped with the necessary specialized hardware and software. During the exercises the students decide on group or individual practical tasks related to the subject matter of the discipline.
The course ends with an examination. During the semester, there is ongoing control. When system work is shown by the students and good results from the current control, the exam is released. The course ends with an examination. During the semester continuous assessment is carried out too. If the students work systematically and achieve good results, they can be exempt from the examination.

SM13015 Diploma Thesis

ECTS credits: 15
Weekly classes: 0lec+0sem+0labs+0ws
Assessment: defense
Type of exam: oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Lecturers from the Department of Computer Systems and Technologies
Abstract:
The diploma thesis e independent creative assignment, which is implemented under the guidance of a supervisor, and if necessary - a research consultant. Its aim is to students to demonstrate the knowledge and skills during training to achieve the goals and objectives of the thesis and defend their thesis before a State Examination Commission.
Course content:
The diploma thesis includes: a note which includes all the basic literature, ideas, existing solutions, analyses, calculations, explanations, conclusions; graphical part which includes schematic diagrams; application with source code and / or developed by the student model or device, if it's part of the job; presentation of the thesis.
Teaching and assessment:
The Department of Computer Systems and Technologies is responsible for collecting, confirming and announcing proposals for topics of theses; distribution of students by themes and supervisors; the diploma practice; leadership, review and defense of theses.
An weekly consultation with the supervisor on which the performance of the tasks is observed is provided for students.
The student defends his/her diploma thesis before the State Examination Commission.

POSTGRADUATE STUDIES IN COMPUTER SYSTEMS AND TECHNOLOGIES

PROFESSIONAL STANDARDS OF A MASTER IN

COMPUTER SYSTEMS AND TECHNOLOGIES (CST)

Degree course : **Computer Systems and Technologies**
Degree awarded: **Master of Engineering in Computer Systems and Technologies**
Professional Qualification: **Computer Engineer (MEng)**
Duration: **1 year (2 terms)**

The professional suitability of a Master of Computer Systems and Technologies is to carry out investigations; to design, assemble and utilize; to perform manufacturing, technological, company and service activities; to do research and teach in the field of Computer and Information Technologies in view of their application in the public and private sectors, industry, agriculture, transport, banking, health care, environment protection, education, science, etc.

A Master of Engineering in Computer Systems and Technologies should possess professional expertise and considerable linguistic competence. His/her education should be based on:

- **complex fundamental and specialised** knowledge in areas such as modelling and simulation, distributed systems, intelligent systems, cloud computing, distributed databases, advanced algorithms, mobile technologies, computer games, design patterns, business modelling systems;
- **additional training** which includes broadening of their foreign language proficiency;
- **carrying out specific scientific research** for the graduation thesis, according to the student's own interests, capabilities and development prospects.

A Master of Engineering should have the following most common skills:

- to identify and present his/her own solutions to problems in the field of Computer and Information Technologies;
- to apply creatively in practice the acquired knowledge in the context of the specified problems;
- to show effective judgement in the selection and use of tools and engineering , based on critical analysis.

A Master of Engineering should also possess the following job-specific skills:

- to develop and adapt modern system and application software for both general purpose and specialised computer systems;
- to expand the functional capabilities of modern computer technologies;
- to be able to identify problems, analyse requirements, design, implement and maintain a software application and the respective documentation;
- to develop, adapt and implement up-to-date computer technologies in different fields of everyday life - industry, agriculture, trade, banking, education, science, etc.

A Master of Engineering in Computer Systems and Technologies should have a clear vision of his/her role and place in the Information Society and the underlying responsibilities.

CURRICULUM
of the Master's degree course in
COMPUTER SYSTEMS AND TECHNOLOGIES

Code	*First term*	*ECTS*	*Code*	*Second term*	*ECTS*
SM17758	Intelligent Computer Systems	5		***Elective courses (students select 3 courses)***	
SM17759	Advanced Technologies in Databases	5	SM17761	Introduction in IoT	4
SM13952	Advanced Algorithm Design	5	SM14698	Digital Audio and Video Content Processing Systems	4
SM17760	Decentralized Technologies	5	SM13083	Virtual Instruments	4
SM15206	Computer Security and Defense	5	SM13955	Programming Systems for Business Modelling	4
S00261	Mobile Technologies	5	SM15208	Information Retrieval	4
			SM14697	Programmable Logic Design	4
				Elective courses (students select 1 course)	
			SM14699	Technologies and methods for software testing	3
			SM17762	Information systems security and threat detection	3
			SM17327	Neural Networks	3
				Graduation	
			S01425	Master Thesis	15
	Total for the term:	***30***		***Total for the term:***	***30***

Total for the degree course : 60 ECTS credits

SM17758 Intelligent Computer Systems

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ws
Assessment: exam **Type of exam:** written
Responsible department:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Svetlana Petrova Stefanova, MEng, PhD, Dept. of Computing, tel.:++359 82 888 356,
E-mail: SStefanova@ecs.uni-ruse.bg
Principal Assistant Elitsa Silyanova Ibryamova, PhD, MEng, Dept. of Computing. Tel.:++359 82 888 827,
E-mail: EIbryamova@ecs.uni-ruse.bg
Summary:
The course “Intelligent Computer Systems” has the objective to acquaint the students with the basic problems, concepts and methodologies, used in the artificial intelligence systems, as well as areas of their application. Development and application of expert systems, as well as of neural networks are the main issues of interest. The emphasis is over the different aspects for applications.
Syllabus Contents:
Basic characteristics of artificial intelligence systems. Expert systems. Neural networks.
Teaching and Learning Methods:
The lectures include the basic theoretical problems in the subject area, which are illustrated with examples. Different problems, connected with topics from the lectures are solved in the practical exercises. The workshops are conducted in a computer room with provided teaching materials. The term is validated, if all the topics from the practical exercises are solved and the lessons are attended regularly. The final mark is formed on the basis of the written test.

SM17759 Advanced Technologies in Databases

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ws
Assessment: continuous assessment **Type of exam:** written
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
1. Assoc. Prof., PhD Irena Valova, Dept. of Computer Systems and Technologies;
E-mail: ivalova@ecs.uni-ruse.bg
2. Assist. Prof., PhD Tsvetelina Kaneva, Dept. of Computer Systems and Technologies;
E-mail: tskaneva@uni-ruse.bg
Abstract:
The aim of training in the discipline "Modern Technologies in Databases" is for students to upgrade and deepen their knowledge in the field of application and use of databases in the development of various applications. In the course it is planned to examine, explore and analyze different types of queries to relational databases, to examine indexes, to consider PL SQL elements such as cursors, triggers and stored procedures. Attention is paid to the basic properties of relational databases and transactions, as well as the principles of distributed and NoSQL databases, the transformation and comparison of relational to NoSQL databases.
The students should have prior training in the following areas: "Software engineering", "Databases", "Object-oriented programming", "Information systems", "Web programming".
Course content:
Relational databases. Indexing and sorting. Tree-based indexes and hash indexes. Using clustering. Transactions. Constraints and triggers. Cursors. Views. Semi-Structured Data and XML. Distributed databases. NoSQL databases.
Teaching and assessment:
During the lectures, students are introduced to the theoretical aspects of different technologies for using different types of databases, as well as to the additional capabilities of relational databases.
The practical exercises are held in a room equipped with personal computers and relevant technological means for the implementation and research of the various technologies provided in the program. It is necessary for the students to be prepared in advance on the lecture material related to the current practical exercise. Conditions have been created for students to apply the acquired theoretical knowledge in practice. For each exercise, there are prepared methodical instructions and tasks for work during the exercise, as well as for self-training.

SM13952 Advanced Algorithm Design

ECTS credits: : 5 **Weekly classes:** 2lec+0sem+0labs+2ws
Assessment: exam **Type of exam:** written and oral
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Emilia Golemanova, MEng, PhD, Dept.of CST; tel.: +359 82 888 681;
E-mail: EGolemanova@ecs.uni-ruse.bg
Principal Assistant Tsanko Golemanov, MEng, PhD, Dept. of CST; tel.: +359 82 888 681;
E-mail: TGolemanov@ecs.uni-ruse.bg
Abstract:
The course offers an overview and a systematic study of the algorithm design techniques. Types of classification tasks (problems) are rigidly introduced. Complexity of algorithms and problems are reviewed. Classifications of problems into solvable/unsolvable, tractable/intractable, and of algorithms into deterministic/randomized, precise/approximate, approximation/heuristic, local search/metaheuristic are introduced. Approaches to dealing with hard computational problems are discussed. The traditional design techniques and modern trends are discussed.
Syllabus contents:
Computational intractability. Review of complexity theory. Coping with hard problems. Overview of algorithm design. Classification of design techniques. Brute force algorithms and exhaustive search. Decrease-and-conquer, Divide-and-conquer, and Transform-and-conquer techniques. Dynamic programming. Intelligent exponential search: backtracking and branch-and-bound. Greedy algorithms: exact greedy algorithms and approximate greedy algorithms. Iterative improvement algorithms (Local search). Metaheuristics. Parallel local search. Genetic algorithms. Modern trends – neural networks, DNA computing, quantum computing, swarm algorithms, immune algorithms, parallel algorithms, etc.
Teaching and learning methods, and assessment:
The lecture topics give the main theoretical aspects of the subject. The students have the availability to practice their knowledge during the workshops. The course resources are given as multimedia presentations.
The course ends with an exam. The exam test includes theoretical questions and practical tasks.

SM17760 Decentralized Technologies

ECTS credits: 5 **Weekly workload:** 2L+0S+0LE+2WS
Control: exam
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Georgi Todorov Georgiev, MEng, PhD; Dept. of Computer Systems and Technolgies;
tel.: 888 744; E-mail: gtgeorgiev@ecs.uni-ruse.bg
Emil Stoyanov, PhD
Abstract:
The aim of the course is to introduce students to the fundamentals of decentralized technologies and their growing application in the modern world. Students will study the architecture of distributed ledger technology (DLT), blockchain, the cryptographic principles that underlie them, and various consensus algorithms. The course includes practical exercises for creating smart contracts and decentralized applications (DApps).
The course has input links with: Software Engineering, Object-Oriented Programming and output links to the implementation of diploma projects.
Teaching and assessment:
Lectures and workshops are carried out in one module, usually taking 2 weeks, during which time the students have no other lessons. The computer labs are equipped with IDEs for software development in different programming languages - Microsoft Visual C++, Eclipse, J2SE JDK, Netbeans.
The workshops simulate in practice the stages of a real project, from assignment through requirements analysis and design to implementation. Students will work in teams. Part of the work can be done outside the labs (e.g. at home). The final mark comprises a final exam (65%), and marks from the workshops (30%) and the lectures (5%).

SM15206 Computer Security and Defense

ECTS credits: 5 **Weekly workload:** 2L+0S+0L+2P
Assessment: exam **Type of exam:** written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Galina Ivanova Ivanova, MEng, PhD, Dept. of CST, tel.: 888 827, E-mail: givanova@ecs.uni-ruse.bg
Principal Assistant Pavel Stoyanov Zlatarov, MEng, PhD, Dept.of CST, E-mail: pzlatarov@uni-ruse.bg
Abstract:
The objective of the Computer Security course is to familiarise the students with the current trends and security standards of computer systems and networks and the data they process.
Course content:
An Introduction to Computer Security. Computer Security Policies. International Standards for Computer Security. Risk Management. Threat Management. Types of Attacks. Cybercrime. User Access Management. Digital Identity and Data Confidentiality. Network Security. Internet Security. Wireless Network Security. Defense methods.
Teaching and assessment:
The lecture hall is equipped with an interactive presentation system. Workshops are in a computer lab equipped with the necessary specialized hardware and software. During the exercises the students decide on group or individual practical tasks related to the subject matter of the discipline.
The course ends with an examination. During the semester, there is ongoing control. When system work is shown by the students and good results from the current control, the exam is released. The course ends with an examination. During the semester continuous assessment is carried out too. If the students work systematically and achieve good results, they can be exempt from the examination.

S00261 Mobile Technologies

ECTS credits: 5 **Weekly classes:** 2lec+0sem+0labs+2ws
Assessment: continuous assessment **Type of exam:** written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Tsvetozar Stefanov Georgiev, MEng, PhD, Dept. of CST, tel.: +359 82 888 827,
E-mail: TGeorgiev@ecs.uni-ruse.bg
Abstract:
The course aims to familiarise students with the modern tendencies in mobile technologies. The course gives necessary information about types of mobile devices, mobile communications, mobile operating systems, mobile multimedia, mobile positioning, and existing architectures for mobile applications and resources for their development. Special attention is paid to the practical realization of various types of mobile applications using development environments and their testing with mobile devices.
Course content:
Mobile systems. Developing mobile applications. Technologies for navigation and positioning services for locating mobile objects. Types of mobile applications. Architectures of mobile applications. User interface for mobile applications. Mobile multimedia.
Teaching and assessment:
At the lectures students are familiarised with the theoretic aspects of the main topics connected to mobile technologies. The practical sessions are conducted in a computer laboratory equipped with the necessary hardware and software environments for development and testing of mobile applications. During the semester the students have two tests, which contain two theoretical questions. The final mark is based on the marks of the two tests and the student's participation in the workshops.

SM17761 Introduction in IoT

ECTS credits: 4 **Workload per week:** 3lec+0sem+0lab+3ws
Assessment: exam **Type of exam:** written
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
1. Assoc. Prof., PhD Irena Valova, Dept. of Computer Systems and Technologies;
E-mail: ivalova@ecs.uni-ruse.bg
2. Assist. Prof., PhD Tsvetelina Kaneva, Dept. of Computer Systems and Technologies;
E-mail: tskaneva@uni-ruse.bg
3. Assist. Prof., PhD Orlin Tomov, Dept. of Computer Systems and Technologies;
E-mail: otomov@ecs.uni-ruse.bg
Abstract:
The course introduces the basic concepts, technologies, and applications of the Internet of Things (IoT). As IoT evolves, devices become increasingly intelligent and interconnected, providing new capabilities for data collection, analysis, and management.
Course content:
The main hardware components of IoT-based systems, the architectures of these systems, the network, sensor layer and data layer are examined. Fog, Edge and Cloud technologies in the context of IoT. Development of IoT applications. Security and privacy. Areas of application.
Teaching and assessment:
During the lectures, students are introduced to the theoretical aspects of systems based on IoT devices.
The practical exercises are held in a room equipped with personal computers and relevant technological means for the implementation and research of the various technologies provided in the program. It is necessary for the students to be prepared in advance on the lecture material related to the current practical exercise. Conditions have been created for students to apply the acquired theoretical knowledge in practice. For each exercise, there are prepared methodical instructions and tasks for work during the exercise, as well as for self-training.

SM14698 Digital Audio and Video Content Processing Systems

ECTS credits: 4 **Weekly workload:** 3lec+0sem+0labs+3ps
Assessment: exam **Type of exam:** written
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Lachezar Lazarov Yordanov, MEng, PhD, Dept. of CST, tel: 082 888 859,
e-mail: liordanov@ecs.uni-ruse.bg
Annotation:
The aim of the course is for students to acquire the theoretical knowledge and the practical implementation of the modern "pipeline" – reproduction-transformation-generation of audio/video content. The course acquaints students with the methodology, processing audio/video signals, as well as optimizing memory and its management in "realtime" environment. Mathematical models will be explored to help with transformations of video/audio datasets.
Course content:
Systems for processing of digital audio and video content – nature, terminology and basic requirements. Pipeline of processing, reproduction and content generation processes. Methods for processing video/audio signals. Mathematical models for performing transformations on video/audio data arrays. Algorithms for encoding and decoding audio/video.
Technology of teaching:
At the lectures the students are introduced theoretically with the theoretical and practical realization of a modern "pipeline" - reproduction - transformation - generation of audio/video content. Students are introduced to the methodology, processing audio/video signals, as well as optimizing memory and its management in "realtime" environment. During the practical exercises, they will become acquainted with algorithms for encoding and decoding of audio/video data (content), their weaknesses and limitations imposed by modern hardware.

SM13083 Virtual Instruments

ECTS credits: 4
Weekly workload: 3lec+0sem+0labs+3ps
Assessment: exam
Type of exam: written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Prof. Tsvetozar Stefanov Georgiev, MEng, PhD, Dept. of CST, tel.: 888 827, E-mail: TGeorgiev@ecs.uni-ruse.bg
Principal Assistant Hovanes Mardiros Avakian, MEng, PhD, Dept. of CST, tel.: 888 674,
E-mail: HAvakian@ecs.uni-ruse.bg
Abstract:
The course aims to familiarise students with the modern tendencies in virtual instruments development. The architecture of virtual instruments, hardware and software environments for their constructing is also examined. Course prerequisite is the knowledge of the Modelling and Simulation.
Course content:
Architecture of virtual instruments. Devices for measurement, testing and automation. LabVIEW software environment for the development of virtual instruments. LabVIEW specialized modules. LabWindows/CVI software environment for the development of virtual instruments. Specialized library NI Measurement Studio for Microsoft Visual Studio for developing virtual instruments. Building virtual systems for measurements and automation.
Teaching and assessment:
At the lectures students are familiarised with the theoretic aspects of the architecture of the virtual instruments, hardware and software environments for their constructing. At the practical sessions they work with specific software environments for virtual instruments development. The course ends with a written and oral exam.

SM13955 Programming Systems for Business Modelling

ECTS credits: 4
Weekly classes: 3lec+0sem+0lab+3ws
Assessment: exam
Type of exam: written and oral
Department involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Svetlana Stefanova, MEng, PhD; Dept. of Computing, tel: 888356,
E-mail: sstefanova@ecs.uni-ruse.bg
Principal Assistant Elitsa Ibryamova, MEng, PhD; Dept. of Computing, tel: 888827,
E-mail: eibryamova@ecs.uni-ruse.bg
Abstract:
The aim of the course "Programming systems for business modelling" is students to acquire knowledge on the theoretical foundations and practical skills at computerization the management and financial accounting activities. This objective is achieved by introducing the specific methods and mathematical models to solve problems in the field of financial accounting, credits and marketing activities on the lectures. Further, students develop specialized software for this purpose using one of the programming languages HTML, PHP, Java, Python, C ++ and C # during the workshops.
Course content:
Enterprise resource planning (ERP)- architecture, basic modules and functions. Rent calculations. Repayment schedules. Leasing operations. Investments efficiency. Commercial contracts. Depreciation methods. Financial accounts and balance. Financial accounting analysis. Applyng statistical methods and models for developing forecasting business software systems.
Teaching and assessment:
The theoretical aspects of the topics are covered on lecture classes. Lectures include both methods and mathematical models and samples of programming segments. Students have the opportunity to put into practice their theoretical knowledge during the workshops. The tasks that are given at the workshops are problem-oriented and students could choose to work with different programming language. The final exam includes written theoretical and practical part, and an oral examination. The final mark is based on activity during workshops and final exam.

SM15208 Information Retrieval

ECTS credits: 4 **Weekly classes:** 3l+0s+3ws+0cw
Assessment: exam **Type of exam**: written and oral
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Yordan Kalmukov, MEng, PhD. tel.: +359 (0)82 888 827, JKalmukov@ecs.uni-ruse.bg;
Abstract:
The course aims to introduce students to the basic methods and algorithms for information retrieval and searching documents, based on their textual content or objects of any type, based on explicit descriptors, such as keywords and/or text annotations.
Syllabus contents:
During lectures, students learn the basic methods and algorithms for text analysis and content-based information retrieval – boolean retrieval; vector space model; latent semantic analysis; probabilistic retrieval and others. Text preprocessing (removal of punctuation and semantically insignificant words, morphological analysis, etc.) is reviewed in details and search evaluation criteria (precision, recall and some complex criteria) are broadly discussed. Students are also introduced to various methods for searching and clustering documents or objects of any type, described explicitly by predefined keywords, organized into an unordered set or taxonomy. During exercises, students practically implement the methods and algorithms they learn during lectures.
Teaching and learning methods:
Teaching consists of lectures and practical exercises. During exercises, students develop information retrieval applications for searching and clustering documents, based on the methods and algorithms they learn during lectures. The teacher monitors and evaluates their work, and the received grade has a weight of 30% on the final grade. The subject ends with a written exam, which gives the remaining 70% of the final grade.

SM14697 Programmable Logic Design

ECTS credits: 4 **Weekly classes:** 3l+0s+0le+3ws
Assessment: exam **Type of exam:** written, oral
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Aneliya Stoyanova Ivanova, MEng, PhD; Dep. of CST; tel.: 082 888 827;
E-mail: AIvanova@ecs.uni-ruse.bg
Abstract:
The course aims to introduce to the students the basic principles of digital systems design using programmable logic. Programmable logic families, device architectures, and programming technologies are covered in detail as well as design methodology, techniques, rules, and guidelines for implementing various digital systems with programmable devices. The students gain practical skills to operate with integrated environments for modeling, synthesis, simulation and configuration of digital systems.
Syllabus contents:
Programmable logic review. CPLD and FPGA. FPGA Architectures with Embedded Devices. Programming Technologies. Design Methodology for Programmable Devices. Design Techniques, Rules, and Guidelines. Embedded Processor-Based Design Flows. Simulation, Synthesis and Verification Design Tools. Future FPGA Developments.
Teaching and learning methods:
At the lectures students are familiarized with popular CPLD and FPGA families, device architectures, and programming technologies as well as methodology and techniques for programmable logic design. During the workshops the students use CAD systems, HDL and FPGA to design and implement various digital devises. The assessment mark is formed on the basis of the results of the practical workshops and the written exam.

SM14699 Technologies and methods for software testing

ECTS credits: 3
Weekly classes: 3lec+0sem+0labs+3ps
Assessment: exam
Type of exam: written
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Lachezar Lazarov Yordanov, MEng, PhD, Dept. of CST, tel: 082 888 859,
e-mail: liordanov@ecs.uni-ruse.bg
Annotation:
The aim of the discipline is to acquaint the students with the entire process of building software, focusing on the tools, with which he is supported-ideology of testing and its importance in a commercial software. Special attention will be given to the practical development of tests - the TDD (Test-driven development) method.
Course content:
Nature and benefits of testing software. Basic terminology. Methodology of testing (static and dynamic testing, white/black box model and visual testing). Scope of testing (unit, integration, system testing, component). Types of testing (regression, sanity, acceptance, security, alpha, beta). The process of testing (waterwall, agile). Automation of testing.
Technology of teaching:
The lectures include the theoretical introduction to the overall process of building the software, focusing on the tools, with which he is supported. They will learn about the ideology of testing and and its importance in a commercial software. Special attention will be given to the practical development of tests using the TDD (Testdriven development) method. During the exercises the students apply the knowledge obtained during the lectures, get acquainted with the test writing library. Apply the testing methods: unit testing and performance testing. Develope software using TDD method.

SM17762 Information systems security and threat detection

ECTS credits: 3
Weekly classes: 3l + 0s + 0lab + 3p
Assessment: exam
Type of exam: written
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Principal Assistant Lachezar Yordanov, MEng, PhD, Department of Computer Systems and Technologies,
phone 888 859, E-mail: lyordanov@ecs.uni-ruse.bg
Abstract:
The main objective of the Information Systems Security and Threat Detection (ISTSD) course is to provide students with the theoretical knowledge and practical skills related to the current aspects of information security and the prevention of network attacks and malicious actions (malware) targeting infrastructure (network devices, server systems, information systems, etc.) and devices used by end users.
Course content:
The subject matter of the course covers issues related to EU and Bulgarian information security regulations, threats to corporate infrastructure and end users. The covered topics include current attack prevention technologies - (NG-) IDS/IPS, firewalls, malicious code protection, DLP, etc.
Teaching and assessment:
Lectures include a theoretical introduction to the nature and aspects of information security of the information systems being built, the minimum requirements for network information security, types of attacks, threats directed at corporate infrastructure, threats directed at end users - Trojan horse; DoS, DDoS, APT. During practical exercises students will apply the knowledge acquired during lectures: firewall research, securing network communications, security settings for systems and operator systems, access rights, passwords.

SM17327 Neural Networks

ECTS credits: 3 **Weekly classes:** 3l + 0s + 0lab + 3p
Assessment: exam **Type of exam:** written
Methodology management:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Assoc. Prof. Svetlana Stefanova, MEng, PhD, Department of Computer Systems and Technologies,
phone 888 356, E-mail: sstefanova@ecs.uni-ruse.bg
Principal Assistant Elitza Ibryamova, MEng, PhD, Department of Computer Systems and Technologies,
phone 888 827, E-mail: eibriyamova@ecs.uni-ruse.bg
Abstract:
The course "Neural Networks" aims to provide students with knowledge in the field of neural networks and the latest developments based on them. The structure and varieties, as well as the areas of their application are considered. Issues related to the creation and use of neural networks are mainly studied. The advantages of their application are considered.
The course has input and output links with disciplines from the bachelor's course in Computer Systems and Technologies: Discrete Structures, Object Oriented Programming, Databases, Artificial Intelligence, Computer Vision, as well as engineering practice and diploma design.
Course content: Introduction to Neural Networks, Neural Model (Perceptron), Neural Network Structure, Shallow Neural Networks, Deep Neural Networks, Popular Neural Networks, Perceptron with Linear Activation Function, Neural Network Training.
Teaching and assessment:
The lectures are held in a hall equipped with a multimedia system.
The practical exercises are conducted in a computer room with specialized software installed.
Methodical guidance is provided for each exercise.
The final form of control is a current evaluation.
The semester is considered passed for those students who have completed all practical exercises and attended lectures regularly.

S01425 Diploma Thesis

ECTS credits: 15 **Weekly classes:** 0lec+0sem+0labs+0ws
Assessment: defense **Type of exam:** oral
Departments involved:
Department of Computer Systems and Technologies
Faculty of Electrical Engineering, Electronics and Automation
Lecturers:
Lecturers from the Department of Computer Systems and Technologies
Abstract:
The diploma thesis e independent creative assignment, which is implemented under the guidance of a supervisor, and if necessary - a research consultant. Its aim is to students to demonstrate the knowledge and skills during training to achieve the goals and objectives of the thesis and defend their thesis before a State Examination Commission.
Course content:
The diploma thesis includes: a note which includes all the basic literature, ideas, existing solutions, analyses, calculations, explanations, conclusions; graphical part which includes schematic diagrams; application with source code and / or developed by the student model or device, if it's part of the job; presentation of the thesis.
Teaching and assessment:
The Department of Computer Systems and Technologies is responsible for collecting, confirming and announcing proposals for topics of theses; distribution of students by themes and supervisors; the diploma practice; leadership, review and defense of theses.
An weekly consultation with the supervisor on which the performance of the tasks is observed is provided for students.
The student defends his/her diploma thesis before the State Examination Commission.

POSTGRADUATE STUDIES IN INTERNET AND MULTIMEDIA COMMUNICATIONS

PROFESSIONAL STANDARDS OF A MASTER IN

INTERNET AND MULTIMEDIA COMMUNICATIONS

Degree course: **Internet and Multimedia Communications**

Degree awarded: **Master of Internet and Multimedia Communications**

Professional Qualification: **Telecommunications Engineer (MEng)**

Duration: **1 year (2 terms)**

1. The educational goal of the master program:

The main goal of the master's degree course is to equip the graduates with in-depth professional knowledge and skills to solve engineering problems in the field of the modern Computer and Internet and Multimedia Communications.

2. Knowledge and skills of the master engineer:

The students can follow the program after finishing the Bachelor degree course. The duration of the master's degree course is two terms for full time students and three terms for part-time students including the writing of the diploma project The students are taught subjects as: Communication systems and processes, Routing in telecommunication networks, Switching processes in local networks, Global Networks and Internet communications, Virtualization technologies and storage area networks, Security in the telecommunication networks, Multimedia Communication System, Administration and management of networks, Systems for Wireless Communications, Web-based collaborative systems and social networks. In the master program a deep attention is emphasized on the analysis of the computer networks. The terminology and the greatest part of the teaching materials are in English, which ensures a good base for usage technical English for the graduates of the program.
The graduates can develop, research and design systems, equipment etc. in the fields of computer networks and technologies by using CISCO products.

3. The area of professional career:

The successful graduates of the master program "Internet and Multimedia Communications" can work as: designers, researchers, constructor, teacher, consultant, administrator of the computer networks in all public or private companies which carrying out research work, production, and engineering activities in the field of modern IP networks and technologies in the whole world. The graduates can work as leading specialist or to become leader of companies in all the areas using computer networks and technologies.

The MEng graduates finishing this Master program have the possibility to continue their degree as doctoral students in the field of information and communication technologies.

CURRICULUM
of the Master's degree course in
INTERNET AND MULTIMEDIA COMMUNICATIONS

Code	*First term*	*ECTS*	*Code*	*Second term*	*ECTS*
SM13065	Communication systems and processes	5	SM13071	Multimedia Communication Systems	4
SM13066	Routing in telecommunication networks	5	SM13072	Administration and management of networks	4
SM13067	Switching processes in local networks	5	SM13073	Systems for Wireless Communications	4
SM13068	Global Networks and Internet communications	5			
				Elective	
SM13069	Virtualization technologies and storage area networks	5		**(students select a course)**	
SM13070	Security in the telecommunication networks	5	SM13074	Technologies for Resource Sharing and Social Networks	3
			SM13075	Design and Architectures of the Video Systems	3
				Graduation	
			SM13027	Master thesis	15
	Total for the term:	***30***		***Total for the term:***	***30***

Total for the degree course: 60 ECTS credits

SM13065 Communication Systems and Processes

ECTS credits: 5 **Weekly workload**: 2l+0s+0lab+2pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Georgi Valentinov Hristov, PhD; MEng; Department of Telecommunications, tel.: (+359 82) 888 663, E-mail: ghristov@uni-ruse.bg
Principal Assistant Diyana Dimitrova Kinaneva, PhD, MEng; Department of Telecommunications, tel.: (+359 82) 888 353, E-mail: dkyuchukova@uni-ruse.bg
Abstract:
As the course title states, the focus of this course is on learning the fundamentals of networking. In this course, you will learn both the practical and conceptual skills that build the foundation for understanding basic networking. First, will examine human versus network communication and see the parallels between them. Next, will be introduced to the two major models used to plan and implement networks: OSI and TCP/IP. Will gain an understanding of the "layered" approach to networks and examine the OSI and TCP/IP layers in detail to understand their functions and services. Student will become familiar with the various network devices, network addressing schemes and, finally, the types of media used to carry data across the network.
Course content:
Communicating over the network. Application layer functionality and protocols. OSI transport layer. OSI network layer. Addressing the network IPv4 and IPv6. Data link layer. OSI physical layer. Principle of network design.
Teaching and assessment:
The lectures are conducted 2 hours weekly, and the practical exercises are 4 hours every 2 weeks. The students are preparing for the exercises, using the recommended literature. For each exercise the students prepare and present to the teacher a report. The exam consists of written and oral parts.

SM13066 Routing in Telecommunication Networks

ECTS credits: 5 **Weekly workload**: 2l+0s+0lab+2pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Georgi Valentinov Hristov, PhD; MEng; Department of Telecommunications, tel.: (+359 82) 888 663, E-mail: ghristov@uni-ruse.bg
Abstract:
The purpose of the course is to introduce the students with the specifics and characteristics of the routing protocols, used in the IP networks – the most widely used and potentially the most interesting for the students type of networks. The main reasons for the complexity of the routing algorithms are also being revised - they are the coordination between the separate devices in the network, the congestion and others. The course introduces the two basic classes of routing protocols – routing protocols in autonomous network segments and routing protocols between autonomous network segments.
Course content:
Introduction to the theory of routing protocols. Structure of the routing tables. Routing protocols in autonomous network segments. Protocols for routing between autonomous network segments. Routing protocols for the next generation of IP networks.
Teaching and assessment:
The lectures are conducted 2 hours weekly, and the practical exercises are 4 hours every 2 weeks. The students are preparing for the exercises, using the recommended literature. For each exercise the students prepare and present to the teacher a report. The exam consists of written and oral parts.

SM13067 Switching Processes in Local Networks

ECTS credits: 5 **Weekly workload**: 2l+0s+0lab+2pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Georgi Valentinov Hristov, PhD; MEng; Department of Telecommunications, tel.: (+359 82) 888 663,
E-mail: ghristov@uni-ruse.bg
Abstract:
The primary focus of this course is on LAN switching and wireless LANs. The goal is to develop an understanding of how a switch communicates with other switches and routers in a small- or medium-sized business network to implement VLAN segmentation. This course focuses on Layer 2 switching protocols and concepts used to improve redundancy, propagate VLAN information, and secure the portion of the network where most users access network services. Switching technologies are relatively straightforward to implement; however, as with routing, the underlying protocols and algorithms are often quite complicated. This course will go to great lengths to explain the underlying processes of the common Layer 2 switching technologies.
Course content:
LAN design. Basic switch concepts and configuration. VLANs. VTP. STP. Inter-VLAN Routing.
Teaching and assessment:
The lectures are conducted 2 hours weekly, and the practical exercises are 4 hours every 2 weeks. The students are preparing for the exercises, using the recommended literature. For each exercise the students prepare and present to the teacher a report. The exam consists of written and oral parts.

SM13068 Global Networks and Internet Communications

ECTS credits: 5 **Weekly workload**: 2l+0s+0lab+2pr
Assessment: Continuous assessment **Type of exam**: written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Plamen Zlatkov Zahariev, PhD, MEng, Dept. of Telecommunications, tel.: (+359 82) 888 663;
E-mail: pzahariev@uni-ruse.bg
Abstract:
The subject “Global networks and Internet communications” has the objective to present to the students the up-to-date trends and technologies for access, transfer and encapsulation of the data in the modern global telecommunication networks and the Internet.
Course content:
The lectures and the practical exercises include the general theory of the global networks, the structure of the physical and the data-link layers, the switching principles, the encapsulation standards, the security mechanisms and various other aspects of these networks. There are also several practically oriented exercises and lectures, which include things like CLI commands for configuration of the interfaces of the WAN devices, how to use access control lists and the various addressing methods and some of the remote access technologies.
Teaching and assessment:
The subject is taught trough the means of lectures and practical exercises. The lectures provide to the students the main theoretical terms and the most actual information about the modern global telecommunication networks. The lectures and the practical exercises are carried out consecutively and on a modular basis. In order to study the various aspects of the modern global networks a number of software programs and languages are being used (Wireshark, PacketTracer etc.), as well as the specialized laboratory sets and stands of the Department of Telecommunications at the University of Ruse.

SM13069 Virtualization Technologies and Storage Area Networks

ECTS credits: 5 **Weekly workload**: 2l+0s+0lab+2pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Plamen Zlatkov Zahariev, PhD, MEng, Dept. of Telecommunications, tel.: (+359 82) 888 663;
E-mail: pzahariev@uni-ruse.bg
Abstract:
The course objective is to familiarize the students with the current trends in the virtualization technologies and the data storage systems. The course goes through the basic types of systems for data storage, focusing mainly on the network storage. The lectures introduce the students to the field of virtualization and to the methods for using individual computer components from different virtual machines, as well as to the practical implementation and use of virtualization software. The different virtualization technologies are presented in details.
Course content:
Fundamentals of the data storage systems, networking file systems and storage area networks, introduction to the virtualization technologies, methods for virtualization of the processor, RAM, hard drive and network interfaces, fault tolerance and High availability, management of large virtual infrastructures, review of software products for virtualization.
Teaching and assessment:
The lectures and the practical exercises are conducted on a modular basis. The students are evaluated at the beginning and at the conclusion of all practical exercises. The exam consists of written and oral parts.

SM13070 Security in the Telecommunication Networks

ECTS credits: 5 **Weekly workload**: 2l+0s+0lab+2pr
Assessment: Continuous assessment **Type of exam**: written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Plamen Zlatkov Zahariev, PhD, MEng, Dept. of Telecommunications, tel.: (+359 82) 888 663;
E-mail: pzahariev@uni-ruse.bg
Abstract:
The subject “Security in the telecommunication networks” has the objective to present to the students the modern threats and attacks on the network security and the types of hardware devices and software mechanisms for providing high level security in the IP based telecommunication systems and networks.
Course content:
The lectures and the practical exercises include the general theory and the main terms of the cryptography, the characteristics of the stream and the block ciphers, the systems, which provide networks security and their main components, the AAA system security model, various specifications and features of the processes, which involve development and implementation of systems with firewalls and the systems for intrusion detection and prevention.
Teaching and assessment:
The subject is taught trough the means of lectures and practical exercises. The lectures provide to the students the main theoretical terms and the most actual information about the security in the telecommunication networks. The lectures and the practical exercises are carried out consecutively and on a modular basis. In order to study the various aspects of the modern global networks a number of software programs (Wireshark, PacketTracer, etc.) and programming languages are being used (Python, etc.), as well as the specialized laboratory sets and stands of the department of “Telecommunications” at the University of Ruse.

SM13071 Multimedia Communication Systems

ECTS credits: 4 **Weekly workload**: 3l+0s+0lab+3pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Dept. of Telecommunication, tel.: (+359 82) 888 839,
E-mail: tiliev@uni-ruse.bg
Abstract:
The subject Multimedia Communication Systems aims to acquaint the students from master course “Internet and Multimedia Communications with the fundamental digital television systems and basic IPTV principles. The main architectures of multimedia information distribution systems are discussed.
Course content:
Analog-digital conversion principles of component video signal. Interactive system for digital TV broadcast. Principles of multimedia information distribution over IP protocol. Architectures of system for multimedia information distribution. Systems for IPTV distribution. Types of consumer devices and additional services.
Teaching and assessment:
The topics of the lectures give the possibility to the students to get acquainted theoretically with the fundamental basics of digital television and multimedia information broadcasting before doing the practical exercises. Students investigate the characteristic of the processed and transmitted signals, using the available laboratory installations and measure instruments.
Lectures discuss mainly the basics of establishment and broadcasting of multimedia information, while the practical exercises pay attention to the characteristics of transmitted signals.
Method of Assessment: 1,5 hours a test covered all questions from the questionnaire.

SM13072 Administration and Management of Networks

ECTS credits: 4 **Weekly workload**: 3l+0s+0lab+3pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Georgi Nikolov Krastev, DSc, Dept. of Computer Systems and Technologies, tel.: (+359 82) 888 672,
E-mail: gkrastev@uni-ruse.bg
Abstract:
Administration and management of networks teaches the fundamentals of engineering operating systems. The Administration and management of networks teaches the fundamentals of engineering operating systems. The following topics are studied in detail: virtual memory, kernel and user mode, system calls, threads, context switches, interrupts, interprocess communication, coordination of concurrent activities, and the interface between software and hardware.
The network statements, viewed, allow the students receive knowledge and skills of most frequently used high level protocols and services, establishing server and client software for these protocols.
Prerequisites for this course are the courses in Data and Computer Communication The knowledge and experience gained in this course may be useful for the MSc thesis.
Course content:
The following topics are studied in detail: virtual memory, kernel and user mode, system calls, threads, context switches, interrupts, interprocess communication, coordination of concurrent activities, and the interface between software and hardware.
The network statements, viewed, allow the students receive knowledge and skills of most frequently used high level protocols and services, establishing server and client software for these protocols.
Teaching and assessment:
The course includes 3 weekly hours of lectures and 3 hours of workshops. The workshops are held in a computer lab with PCs running Microsoft Windows.

SM13073 Systems for Wireless Communications

ECTS credits: 4 **Weekly workload**: 3l+0s+0lab+3pr
Assessment: Exam **Type of exam**: written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Assoc. Prof. Nina Vasileva Bencheva, PhD, MEng; Dept. of Telecommunications; tel.: (+359 82) 888 823;
E-mail: nina@uni-ruse.bg
Principal Assistant Nikolay Genkov Kostadinov PhD, MEng, Dept. of Computer Systems and Technologies;
tel.: (+359 82) 888 674; E-mail: NKostadinov@uni-ruse.bg
Abstract:
The subject “Systems for Wireless Communications” has the objective to familiarize the students of the “Internet and Multimedia Communications” degree course with some contemporary Wireless Processors and digital signal processor (DSP) families and their architecture. It provides general information about systems for automation of the design and testing microprocessor systems based on Wireless Processors and DSP. The subject is related to the following subjects “Impulse and Digital Devices”, “Microprocessor systems”, Signal processors” and “Computer Architecture” as well as to the Diploma project.
Course content:
Wireless Processors Architecture. Open AT® Software Suite Architecture and Features. Hardware control services. Communications services and standard protocol support. DSP architecture. Central Processing Unit. Bus structure. Internal memory organization. Data addressing. Program memory addressing. Pipeline operation. On-Chip Peripherals. Serial ports. External bus interface. DSP applications.
Teaching and assessment:
The lectures have the purpose to review mainly the hardware design, while the emphasis of the practical exercises is on the development of the software of the microprocessor systems. The practical works are carried out in a computer laboratory equipped with developing environments based on PC and specialized demonstration boards. At the beginning of each laboratory exercise an entrance test is conducted to check the students’ preparation.

SM13074 Technologies for resource sharing and social networks

ECTS credits: 3 **Weekly workload**: 3l+0s+0lab+3pr
Assessment: Continuous assessment **Type of exam**: scores from practical tasks + test
Department involved:
Department of Telecommunications,
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Plamen Zlatkov Zahariev, PhD, MEng, Dept. of Telecommunications, tel. (+359 82) 888 663,
E-mail: pzahariev@uni-ruse.bg
Abstract:
The objectives of the course are to acquaint the students with the modern tools and solutions for cloud sharing of resources, as well as with the technologies, features and functional capabilities of the social networks. The lecture material covers basic concepts from the field of cloud-based systems, the platforms, software and networks as services, but also covers more practically oriented topics, which are related to the creation of cloud resources, sharing resources and working with information in various social networks.
Course content:
Fundamentals of the resource sharing technologies. Principles of the Cloud services. Main features and characteristics of Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). Social networks and content distribution networks.
Teaching and assessment:
The lectures and the practical exercises are conducted on a modular basis. The students are evaluated at the beginning and at the conclusion of all practical exercises. The course concludes with a score on the practical assessments and with a test.

SM13075 Design and Architectures of Video Systems

ECTS credits: 3 **Weekly workload**: 3l+0s+0lab+3pr
Assessment: Continuous assessment **Type of exam**: written
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Prof. Teodor Bozhidarov Iliev, PhD, MEng, Dept. of Telecommunication, tel.: (+359 82) 888 839,
E-mail: tiliev@uni-ruse.bg
Abstract:
The subject Design and architectures of the video systems has the objective to acquaint the students with the principles and creation of different architectures for the CCTV systems. The main characteristics of the CCTV system development process are being discussed and evaluated.
Course content:
Basic terms and characteristics of a CCTV system. Elements of the CCTV systems. Types of architectures for design and creation of CCTV systems. IP based digital video surveillance. Main characteristics of the design process of the systems for video surveillance. Software for management and recording of IP cameras.
Teaching and assessment:
The topics of the lectures give the possibility to the students to get acquainted theoretically with the main issues of the CCTV systems and their main architectures and elements before doing the practical exercises.

SM13027 Master Thesis

ECTS credits: 15 **Weekly workload:** 0l+0s+0lab+0pr
Assessment: Official defense **Type of exam**: oral
Departments involved:
Department of Telecommunications.
Faculty of Electrical Engineering, Electronics and Automation.
Lecturers:
Lecturers from the Department of Telecommunications and experts in the field of telecommunications.
Abstract:
The Diploma thesis is an independent creative project. It represents a solution to an engineering task, which is developed under the guidance of a scientific supervisor. The purpose of the development is for students to demonstrate their knowledge and skills acquired during their studies. It enables students completing the educational and qualification degree “Master – Engineer” to demonstrate their abilities to plan and implement projects in the field of telecommunications, to work independently, to show initiative and professional competence. The thesis is presented and defended before the State Examination Commission.
Course content:
The Diploma thesis consists of a written report (an explanatory note), which includes a literature review and analysis of existing solutions to the problem, a description of the proposed solution (used design methods, calculations, etc.), conclusions, and references. The graphical part includes block diagrams, schematic diagrams, diagrams, charts for graphical representation of test results. During the defense, students must demonstrate their developed models or prototypes.
Teaching and assessment:
The Department of Telecommunications is responsible for approving and announcing diploma thesis topics, supervising graduate students, reviewing and organizing public defenses. Students develop the thesis under the guidance of professors from the department or external specialists in the field of telecommunications. The state examination committee evaluates the students' work and defense with two separate grades.

Erasmus

ECTS

Information Package

Editor:

Stoyanka Smrikarova

Technical Staff:

Vladimir Dochev

Publishing centre

“Angel Kanchev” University of Ruse