

DESCRIPTION OF THE COURSE

Name of the course: Electrical Machinery – I	Code: BpEE01	Semester: 5
Type of teaching: Lectures (L) Laboratory work (LW) Course work (CW)	Hours per semester: L – 45 hours LW – 30 hours	Number of credits: 6

LECTURER(S):

Assoc. Prof. Eng. Vasil Spasov, PhD (FEA), tel.: 032 659-535,
e-mail: vasilspasov@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum for training of students to obtain Bachelor's degree, specialty Electrical Engineering, Professional orientation 5.2 Electrical Engineering, Electronics and Automation, Field 5. Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: To introduce students to the general issues concerning the design, principle of operation and characteristics of the following types of electrical machines – transformers, induction motors, special induction motors and induction micromotors. The physical nature of electromagnetic phenomena in electrical machines is discussed on the basis of the respective mathematical apparatus. The main relationships from electrical machines theory are derived. The lecture material is presented from both the viewpoint of design and practical application of electrical machines in electric power engineering and electric drives.

DESCRIPTION OF THE COURSE: Basic topics: Transformers – design and principle of operation; Voltage equations, equivalent diagrams and vector diagrams of single-phase two-winding transformer; Transformer operation at no-load, short circuit and loading; Calculation of the transformer magnetic circuit; Schemes and groups of connection of transformers; Parallel operation; Voltage control in transformers; Autotransformers – equations, equivalent diagrams and vector diagrams; Three-winding transformers - equations and equivalent diagrams; No-load, short-circuit and loading modes of tree-winding transformers; Asymmetrical modes and transients in transformers; Theory of a.c. machines; Windings of a.c. machines; Electromotive force in a.c. windings; Magnetomotive force in a.c. windings; Induction machine at locked rotor; Referring the rotor winding to stator winding; Voltage equations and equivalent diagrams of induction machines; Operation of induction machine as motor, generator and counterswitching mode – power relationships and vector diagrams; Rotating torques, circular diagram and characteristics of induction machine; Starting of three-phase induction motors and speed control; Squirrel cage induction motors with current displacement in rotor winding; Operation of induction motors under non-rated conditions; Special induction machines; Single-phase and capacitor induction motors; Induction micromachines.

PREREQUISITES: Mathematics, Physics, Mechanics, Machine elements, Theoretical Electrical Engineering, Electrical measurements.

TEACHING METHODS: Lectures and Laboratory exercises. The lectures are delivered by multimedia. The exercises are provided with a manual and are conducted in a laboratory equipped with specialized stands. The students prepare an individual report for each exercise and defend it before the supervising lecturer.

METHOD OF ASSESSMENT: Laboratory exercises (20 %), course work with two tasks (20 %) and written exam (60 %).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Ангелов А., Д. Димитров. Електрически машини, част първа, София, Техника, 1988; 2. Волдек А. Електрически машини, София, Техника, 1978. 3. В. Динов. Електрически машини, София, Техника, 1991, ISBN 954-03-0020-7. 4. Соколов Е. Изследване и изпитване на електрически машини, София, Техника, 1977. 5. Дончев Д., Митев Е., Божилов Г. Ръководство за семинарни упражнения по електрически машини, София, Техника, 1976. 6. Димитров Д., Ваклиев И., Сотиров Д., Стоянов М. Ръководство за изпитване на електрически машини, София, Техника, 1991. 6. Nasar S. Schaum's outline of theory and problems of electric machines and electromechanics, McGraw – Hill, 1998, ISBN 0-07-045994-0; 7. Mukerji S. Electromagnetics for Electrical Machines, CRC Press, London, 2015, ISBN 978-1-4987-0915-6.

DESCRIPTION OF THE COURSE

Name of the course: Electrical apparatus – I	Code: BpEE02	Semester: 5
Type of teaching: Lectures (L) Laboratory work (LW) Course work (CW)	Hours per semester: L – 45 hours LW – 30 hours	Number of credits: 6

LECTURER(S):

Assoc. Prof. Eng. Ivan Hadzhiev, PhD (FEA), tel.: 032 659-686,
e-mail: hadzhiev@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum for training of students to obtain Bachelor's degree, specialty Electrical Engineering, Professional orientation 5.2 Electrical Engineering, Electronics and Automation, Field 5. Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: After completion of the course the students will be acquainted with the underlying essence of the heat, electrodynamic and electromagnetic processes and phenomena, as well as with the application of the studied dependencies for calculation of the components of electrical apparatus.

DESCRIPTION OF THE COURSE: Main topics: Electrodynamic phenomena in electrical apparatus – methods for calculating the electrodynamic forces and moments at direct, alternating and short circuit currents; Heating and cooling in electrical apparatus – heat transfer, stable and transient processes at heating and cooling, at short circuit, thermal stability of the apparatus; Electromagnetic systems – magnetic circuits for direct and alternating current, electromagnets and magnetic circuits with permanent magnets, dynamics and time of triggering the electromagnets, calculation of their coils; Static electromagnetic devices – inductors, reactors etc.; Electromagnetic actuators, electromagnetic sensors and special transformers.

PREREQUISITES: Mathematics, Physics, Mechanics, Theoretical Electrical Engineering, Electrical materials, Electrical Measurements.

TEACHING METHODS: Lectures and Laboratory exercises. Lectures, prepared for multimedia presentation and laboratory exercises, during which experiments, related to the topics of the lectures are conducted.

METHOD OF ASSESSMENT: Laboratory work (15%), course work (20%) and written examination (65%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Alexandrov A., Electrical apparatus - part I, Electromagnetic and thermal problems, Heron Press, Sofia, 2002, 337, ISBN 954-580-117-4 (Bulgarian); 2. Maslarov I., S. Shishkova-Panaiotova, Laboratory experiments on electrical machines and apparatus. Plovdiv, 2000 (Bulgarian); 3. Alexandrov A., H. Gergova, V. Piperov, Guide seminars on electrical apparatus, Sofia, 2000 (Bulgarian); 4. Malamov D., Design of drive electromagnets: Part One: Electromagnets for constant voltage Part Two: Electromagnets the AC power frequency, Plovdiv, MACROS, 2013 (Bulgarian); 5. Pisarev A., A. Lichev, Design of switchgear for low voltage, Sofia, Technics 1987 (Bulgarian).

DESCRIPTION OF THE COURSE

Name of the course: High Voltage Engineering	Code: BpEE03	Semester: 5
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S)	Hours per semester: L – 30 hours S – 0 hours LW – 30 hours	Number of credits: 5

LECTURER(S):

Assoc. Prof. Eng. Stanimir Stefanov, PhD (FEA), tel.: 032659512, e-mail: glasst@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum for training of students to obtain Bachelor's degree, specialty Electrical Engineering, Professional orientation 5.2. Electrical Engineering, Electronics and Automation, Field 5. Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The subject aims at introducing students to new theoretical knowledge and practical skills in different fields: isolation characteristics of electric high voltage systems; over-voltages in electric networks and devices, over-voltage protection, selection of isolation levels in the high voltage systems.

DESCRIPTION OF THE COURSE: The main topics concern: Insulation characterizations of electric power equipment and grid – electrical break in air, variety test voltage of equipment, insulation characterizations of insulation, effect crown, skin discharges; Stability over-voltage, resonance over-voltages, commutation over-voltages – by turn off reactive loads, by turn on and turn off distribution lines; Lightning's over-voltages – electromagnetic processes, characterizations of lightning activity, valve down-leads, lightning's over-voltage in electrical outfits; Coordination of isolation, choice of isolation levels. Electromagnetic waves in power lines.

PREREQUISITES: Theoretical Electrical Engineering, Physics, Electrical Materials, Semiconductor Materials, Safety Engineering.

TEACHING METHODS: Lectures, using slides, case studies, laboratory work whit protocols and defence.

METHOD OF ASSESSMENT: Written exam at the end of the semester (80%), laboratory work (20%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Стефанов С., В. Русева, Д. Димов, Записки лекции по Техника на високите напрежения, Русе, 2003; 2. Влъчев М., М. Георгиев. А. Тодорова, Г. Дюстабанов, П. Тошев, Техника на високите напрежения. ДИ Техника, София, 1980; 3. Неделчев Н., С. Неделчева, Техника на високите напрежения, ТУ- София, 20015/2016; 4. Неделчева С., М., Мацанков, Техника на високите напрежения – Тестове, Технически университет – София, 2014; 5. Воробьев Г. А. и др., Физика диелектриков, ТПУ, Томск, 2003; 6. Генов Л., Техника на високите напрежения в електроенергийните системи, ДИ "Техника", София, 1992; 7. Нанчев Н., М. Георгиев, Техника на високите напрежения, ДИ "Техника", София, 1997; 8. Иванов Кр., П. Петров, Техника на високите напрежения, Ръководство за лабораторни упражнения. "Принт", Габрово, 2000; 9. Михалков А. В., Техника високих напрежений в примерах и задачах, Высшая школа, Москва, 1965; 10. Генчев М., С. Стефанов – презентационни записки по „Техника на високите напрежения“. xpsd.

DESCRIPTION OF THE COURSE

Name of the course: Embedded systems and programmable controllers	Code: BpEE04	Semester: 5
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 45 hours S – 0 LW – 0 hours	Number of credits: 4

LECTURER(S):

Assoc. Prof. Sevil Ahmed-Shieva, PhD (FEA) tel.: 032 659 583, e-mail: sevil.ahmed@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory for training of students to obtain Bachelor's degree, specialty Electrical Engineering 5.2 Electrical Engineering, Electronics and Automation, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: At the end of the course the students are expected to have basic knowledge how to design and implement embedded systems. Programmable microcontrollers are also concerned as a standalone components or integrated part of more complicated systems. Basic skills of programming and input/output configuration would be gained.

DESCRIPTION OF THE COURSE: This course introduces basic knowledge on embedded systems and programmable microcontrollers. The main topics concern: Data exchange in embedded systems; Programmable logic devices and systems; Real-Time Operating Systems; Methodology in software development; Software architecture; Design of Embedded Control Systems; Fault detection and fault tolerant control; Control, Verification and Validation of Software.

PREREQUISITES: Mathematics I, Mathematics II, Programming I, Programming and mathematical modelling tools.

TEACHING METHODS: Lectures, visually illustrated; demo systems and programs.

METHOD OF ASSESSMENT: Written final examination.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Иванов И. Е. и О. Маринов, Микропроцесорна техника, ч. I, ТУ София, 2007; 2. Yiu, Joseph, The Definitive Guide to the ARM Cortex-M3, Newnes, USA, 2007; 3. K. Arnold, Embedded Controller Hardware Design, LLH Technology Publishing, ISBN 1-878707-87-6, 2001; 4. J. Ganssle, Embedded Systems. World Class Designs, Newnes Press, ISBN-13: 978- 0750686259, 2007; 5. B. Yang and I. Abramova, Dynamic Systems: Modeling, Simulation, and Analysis. Cambridge: Cambridge University Press, 2022

DESCRIPTION OF THE COURSE

Name of the course: Lighting and Installation Technology	Code: BpEE05	Semester: 5
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S)	Hours per semester: L – 30 hours S – 0 hours LW – 15 hours	Number of credits: 4

LECTURER(S):

Assoc. Prof. Eng. Stanimir Stefanov, PhD (FEA), tel.: 032659512, e-mail: glasst@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum for training of students to obtain Bachelor's degree, specialty Electrical Engineering, Professional orientation 5.2. Electrical Engineering, Electronics and Automation, Field 5. Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The objectives of the course “Lighting and Installation Technology” are extending students’ knowledge in the field of photometry and colorimetry, the component base of lighting and installation technique, the physiological optics, design and exploration of lighting systems, lighting and signaling electrical installations.

DESCRIPTION OF THE COURSE: The subject of the course is directly connected with the profile of the major and covers theoretical bases in lighting technology; Structure and functioning of the human visual analyzer; Structure, parameters and applications of light sources and luminaries; Requirements, calculations and methods for design of interior and exterior lighting systems; Specific requirements, methods for sizing and design of lighting and signaling electrical installations.

PREREQUISITES: Theoretical Electrical Engineering, Physics, Electrical Materials, Semiconductor Materials, Safety Engineering.

TEACHING METHODS: Lectures, using slides, case studies, laboratory work whit protocols and defence.

METHOD OF ASSESSMENT: Two one-hour assessments at mid and end of semester (80%), laboratories (20%)

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1 Пачаманов А., Електроснабдяване и осветителна техника. Част 1. Основи на осветителната техника; Част 2. Проектиране на осветителни уредби и електрически инсталации, ТУ - София 2002, 2004; 2. Иванов З., Осветителна и инсталационна техника, София, Авангард Прима, 2010; 3. Пачаманов А., Нели Рац. Ръководство за лабораторни упражнения по осветителна и инсталационна техника. Авангард Прима, София, 2005; 4. Василев Н., Промислено осветление, София, Техника, 1973; 5. БДС EN 12464; 6. БДС EN 13201; 7. НАРЕДБА No3 от 9.06.2004 г. за устройство на електрическите уредби и електропроводните линии.

DESCRIPTION OF THE COURSE

Name of the course: Power engineering	Code: BpEE06	Semester: 5
Type of teaching: Lectures(L) Laboratory work (LW)/Seminaries (S)	Hours per semester: L – 15 hours S – 0 hours LW – 0 hours	Number of credits: 3

LECTURER(S):

Assoc. Prof. Eng. Stanimir Stefanov, PhD (FEA), tel.: 032659512, e-mail: glasst@tu-plovdiv.bg

Assist. Prof. Eng. Vasil Drambalov PhD (FEA), e-mail: v_drambalov@tu-plovdiv.bg, тел.:

032 659535, Technical University of Sofia, Dep. of Plovdiv

COURSE STATUS IN THE CURRICULUM: Compulsory course for full-time students in the specialty "Electrical Engineering" of FEA at TU-Sofia, Plovdiv Branch, educational qualification degree "Bachelor" professional field 5.2 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE Introducing students to the ways of obtaining electricity from various renewable and non-renewable energy sources on earth and the Republic of Bulgaria. Basic elements of the electric power system. Conversion of solar radiation into electricity and heat. Use of the energy potential of wind and sea currents, of the thermal gradient of water for obtaining electricity. Possibilities for using the energy resource of biomass and solid household waste for production of electricity and heat, etc.

DESCRIPTION OF THE COURSE: Main topics: Energy balance of the planet Earth. Energy problem. Energy resources - traditional and non-traditional, non-renewable and renewable. Use of energy from water resources. Hydropower potential of small hydro sources (rivers). The sun as a source of energy. Assessment of the potential of solar radiation - components and measurement of radiation. Wind power engineering. Characteristics of wind as a meteorological phenomenon. Using the energy of the wind flow. Biomass and the use of biomass for energy production.

PREREQUISITES: Physics, Electrical Engineering, Renewable Energy Sources, Electrical Materials, Power Engineering, Industrial Production Systems.

TEACHING METHODS: Lectures using multimedia and demo programs.

METHOD OF ASSESSMENT: Two one-hour written current assessments in the middle and end of the semester (100% in total).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Pazvantov T. Renewable energy sources, part I. Varna 2006. 2. Lukutin B.V., Renewable sources of electricity: TPU Publishing House, 2008. 3. Rickerson W. Introduction to RETScreen Clean Energy Decision Analysis Software 2006. 4 .Photovoltaic system, Planning & Installing, Frank Jackson, Green Dragon, Berlin, 2007. 5. Elistratov V.V., Kuznetsov M.V. Theoretical foundations of non-traditional and renewable energy: St. Petersburg State Polytechnical University, 2003. 6. Burton T. , Share D., Jenkins N Wind Energy Handbook 2007.

DESCRIPTION OF THE COURSE

Name of the course: Embedded systems and programmable controllers - project	Code: BpEE07	Semester: 5
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 0 hours S – 0 LW – 0 hours	Number of credits: 2

LECTURER(S):

Assoc. Prof. Sevil Ahmed-Shieva, PhD (FEA) tel.: 032 659 583, e-mail: sevil.ahmed@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory for training of students to obtain Bachelor's degree, specialty Electrical Engineering 5.2 Electrical Engineering, Electronics and Automation, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: At the end of the course the students are expected to have basic knowledge how to design and implement embedded systems. Programmable microcontrollers are also concerned as a standalone components or integrated part of more complicated systems. Basic skills of programming and input/output configuration would be gained.

DESCRIPTION OF THE COURSE: The project has an individual assignment for each student. The assignments are with practical focus and follow the topics of the lecture course in "Embedded systems and programmable controllers". The aim is to provoke students' skills to find solutions of problems in the field of embedded systems and microcontroller programming.

PREREQUISITES: Mathematics I, Mathematics II, Programming I, Programming and mathematical modelling tools.

TEACHING METHODS: Consultations and discussions.

METHOD OF ASSESSMENT: Defense presentation.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Иванов И. Е. и О. Маринов, Микропроцесорна техника, ч. I, ТУ София, 2007; 2. Yiu, Joseph, The Definitive Guide to the ARM Cortex-M3, Newnes, USA, 2007; 3. K. Arnold, Embedded Controller Hardware Design, LLH Technology Publishing, ISBN 1-878707-87-6, 2001; 4. J. Ganssle, Embedded Systems. World Class Designs, Newnes Press, ISBN-13: 978- 0750686259, 2007; 5. B. Yang and I. Abramova, Dynamic Systems: Modeling, Simulation, and Analysis. Cambridge: Cambridge University Press, 2022

DESCRIPTION OF THE COURSE

Name of the course: Electrical Machinery – II	Code: BpEE08	Semester: 6
Type of teaching: Lectures (L) Laboratory work (LW) Course work (CW)	Hours per semester: L – 45 hours LW – 30 hours	Number of credits: 6

LECTURER(S):

Assoc. Prof. Eng. Ivan Hadzhiev, PhD (FEA), tel.: 032 659-686,

e-mail: hadzhiev@tu-plovdiv.bg

Assist. Prof. Eng. Vasil Drambalov, PhD (FEA), tel.: 032 659-687,

e-mail: v_drambalov@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum for training of students to obtain Bachelor's degree, specialty Electrical Engineering, Professional orientation 5.2 Electrical Engineering, Electronics and Automation, Field 5. Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: To introduce students to the general issues concerning the design, principle of operation and characteristics of the following types of electrical machines – synchronous machines, d.c. machines, micromachines and electrical machines used in automation. The physical nature of electromagnetic phenomena in electrical machines is discussed on the basis of the respective mathematical apparatus. The main relationships from electrical machines theory are derived. The lecture material is presented from both the viewpoint of design and practical application of electrical machines in electric power engineering and electric drives.

DESCRIPTION OF THE COURSE: Basic topics: Synchronous machines – design and principle of operation; Armature reaction at resistive, resistive-inductive, inductive and capacitive load; Magnetic field and parameters of synchronous machines; Method of the two reactions for salient-pole synchronous machine; Voltage equations and vector diagrams of saturated and non-saturated synchronous machine; Characteristics of synchronous generators; Parallel operation of synchronous machines; Modes of operation of synchronous machines at parallel operation; V-shape characteristics; Angular characteristics; Synchronous motors – vector diagram, operational characteristics and starting; Synchronous compensators; Asymmetrical modes and transients in synchronous machines; Design, principle of operation and modes of operation of d.c. electrical machines; Windings of d.c. machines; Electromotive force in armature winding; Electromagnetic torque and electromagnetic power; Armature reaction and its influence on machine operation; Commutation in d.c. machines; D.c. generators; Characteristics of independent excitation generator; Parallel excitation generators – conditions for self-excitation and characteristics; Characteristics of series and compound generators; Parallel operation of d.c. generators; D.c. motors – types and characteristics; Steady operation; Starting and speed control of d.c. motors; Braking modes of d.c. motors; A.c. commutator motors; D.c. micromachines; Brushless d.c. motors; Main dimensions; volume and weight of electrical machines; Heating and cooling of electrical machines.

PREREQUISITES: Mathematics, Physics, Mechanics, Machine elements, Theoretical Electrical Engineering, Electrical measurements, Electrical machinery I.

TEACHING METHODS: Lectures and Laboratory exercises. The lectures are delivered by multimedia. The exercises are provided with a manual and are conducted in a laboratory equipped

with specialized stands. The students prepare an individual report for each exercise and defend it before the supervising lecturer.

METHOD OF ASSESSMENT: Laboratory exercises (20 %), course work with two tasks (20 %) and written exam (60 %).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Ангелов А., Д. Димитров. Електрически машини, част първа, София, Техника, 1988; 2. Волдек А. Електрически машини, София, Техника, 1978. 3. В. Динов. Електрически машини, София, Техника, 1991, ISBN 954-03-0020-7. 4. Соколов Е. Изследване и изпитване на електрически машини, София, Техника, 1977. 5. Дончев Д., Митев Е., Божилов Г. Ръководство за семинарни упражнения по електрически машини, София, Техника, 1976. 6. Димитров Д., Ваклиев И., Сотиров Д., Стоянов М. Ръководство за изпитване на електрически машини, София, Техника, 1991. 6. Nasar S. Schaum's outline of theory and problems of electric machines and electromechanics, McGraw – Hill, 1998, ISBN 0-07-045994-0; 7. Mukerji S. Electromagnetics for Electrical Machines, CRC Press, London, 2015, ISBN 978-1-4987-0915-6.

DESCRIPTION OF THE COURSE

Name of the course: Electrical apparatus – II	Code: BpEE09	Semester: 6
Type of teaching: Lectures (L) Laboratory work (LW) Course work (CW)	Hours per semester: L – 45 hours LW – 30 hours	Number of credits: 6

LECTURER(S):

Assoc. Prof. Eng. Ivan Hadzhiev, PhD (FEA), tel.: 032 659-686,
e-mail: hadzhiev@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum for training of students to obtain Bachelor's degree, specialty Electrical Engineering, Professional orientation 5.2 Electrical Engineering, Electronics and Automation, Field 5. Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: After completion of the course the students will have acquired knowledge of the physical processes and dependencies of the processes of switching in electrical circuits, arcing horns, contact systems and insulation structures of the electrical apparatus.

DESCRIPTION OF THE COURSE: Main topics: Characteristics and conditions for burning and extinguishing electric arc; Arcing devices in AC and DC; Switching circuits, surge, etc.; Physical phenomena in the contact area of the electrical connections; Constructions of commutative and non-commutative contact connections; Contact materials; Insulation construction of electrical apparatus-influencing factors, coordination and protection of insulation, methods for improving the breakdown voltage.

PREREQUISITES: Mathematics, Physics, Chemistry, Mechanics, Theoretical electrical engineering, Electrical measurements, Electrical apparatus – part I.

TEACHING METHODS: Lectures and Laboratory exercises. Lectures, prepared for multimedia presentation and laboratory exercises, during which experiments, related to the topics of the lectures are conducted.

METHOD OF ASSESSMENT: Laboratory work (15%), course work (20%) and written examination (65%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Alexandrov A., I. Yatchev, Electrical Apparatus - part II, Avangard Prima, Sofia, 2010 (Bulgarian); 2. Maslarov I., S. Shishkova-Panaiotova, Laboratory experiments on electrical machines and apparatus, Plovdiv, 2000 (Bulgarian); 3. Pisarev, A.N. and others, Guide the design of switchgear for low voltage Sofia, Technics, 1987 (Bulgarian); 4. Tseneva R., Electrical contact, Sofia, 2004 (Bulgarian); 5. Pisarev A., Lichev A., Design of switchgear for low voltage, Sofia, Technics 1987 (Bulgarian); 6. Taev I., Fundamentals of the theory of electrical apparatus, Moscow, 1987 (Russian).

DESCRIPTION OF THE COURSE

Name of the course: Electrical converters and energy efficiency	Code: BpEE10	Semester: 6
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S) Course work (CW)	Hours per semester: L – 30 hours S – 0 hours LW – 25 hours	Number of credits: 6

LECTURER(S):

Assoc. Prof. Eng. Misho Matsankov, PhD (FEA), tel.: 032 659 686 e-mail: mishel@tu-plovdiv.bg

Assoc. Prof. Eng. Georgi Ganey, PhD (FEA), тел.: 032 659 560, email: gganey@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Mandatory discipline from the curricula for training students for the Bachelor's degree program, majors "Electrical engineering, in the professional field 5.2 Electrical engineering, electronics and automation, area 5. Technical sciences.

AIMS AND OBJECTIVES OF THE COURSE: After completing the course, students should be able to use various power converters - operate ready-made converters, develop new systems and objects in which converters are a component, select and supply ready-made converters.

DESCRIPTION OF THE COURSE: Main topics: Application of converters in the processes of generation, transmission and consumption of electricity; Classification of converters according to their main functions; Methods of converting electricity; Main characteristics of the converters in relation to the supply network and in relation to the load; Basic units of converters; Cooling of converters; Overview and comparison of classic and modern converter circuits (AC/DC; AC/AC; DC/AC and DC/DC converters); Methods of control of conversion devices; Selection of complete conversion devices; Regulatory requirements for complete conversion devices; Electromagnetic compatibility; Energy efficiency.

PREREQUISITES: Theoretical Electrical Engineering, Electrical Materials, Electrical Measurements, Electrical Machines, Semiconductor Elements, Digital Circuit Engineering..

TEACHING METHODS: Lectures are delivered as multimedia presentations. Laboratory exercises are conducted with laboratory benches and real devices and computer simulations; The results are systematized in protocols and defended to the leader of the exercise..

METHOD OF ASSESSMENT: Written exam at the end of the semester. The final grade is formed as an average grade of the written work (75%) and the participation in laboratory exercises (25%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Минчев М., Й.Шопов, М.Рац. Преобразователна техника. Сиела, София, 2006; 2. Rashid M. Power Electronics Handbook. Academic Press, London, UK, 2001; 3. Antchev M. Technologies for Electrical Power Conversion, Efficiency and Distribution: Methods and Processes. Hershey, NY, USA, 2010; 4. William B. Principles and Elements of Power Electronics, Glasgow, UK, 2006.

DESCRIPTION OF THE COURSE

Name of the course: Design of Electrical Machines	Code: BpEE11	Semester: 6
Type of teaching: Lectures(L) Laboratory work (LW)	Hours per semester: L – 45 hours LW – 20 hours	Number of credits: 6
Course project (CP)	Code: BpEE13	Number of credits: 2

LECTURER(S):

Assoc. Prof. Eng. Vasil Spasov, PhD (FEA), tel.: 032 659-535,
e-mail: vasilspasov@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum for training of students to obtain Bachelor's degree, specialty Electrical Engineering, Professional orientation 5.2 Electrical Engineering, Electronics and Automation, Field 5. Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The lectures introduce the students to the electrical, magnetic, insulation, thermal and mechanical design of rotating electrical machines. In the course project the students design a general-purpose induction machine from the 4A series in the power range from 1.5 to 100 kW.

DESCRIPTION OF THE COURSE: The main topics concern: Modern trends in the design of electric machines; Determination of the main dimensions of induction machines; Determination of electromagnetic loads of induction machines; Types of windings of electric machines; Calculation of the stator winding for alternating current; Calculation of the short-circuited rotor winding of an induction motor; Stator and rotor slots for windings of electric machines; Determination of the geometrical characteristics of a stator and a rotor sheet for induction machines; Calculating the magnetic circuit of induction machines; Thermal and ventilation calculations of electrical machines; Calculation of the starting and operating characteristics of an induction motor with short-circuited rotor.

PREREQUISITES: Mathematics, Physics, Theoretical Electrical Engineering, Electrical Machines, Electrical Apparatus.

TEACHING METHODS: Lectures and Laboratory work. The lectures are delivered by multimedia. The exercises are taught in a computer room. Every student prepares an individual project of a rotating electric machine.

METHOD OF ASSESSMENT: Laboratory work (20%) and exam (80%). The course project has a separate assessment and is defended before the supervising lecturer.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Проектирование электрических машин, под ред. И. Копылова, 4-е изд., М., 2011, ISBN 978-5-9916-0904-3; 2. Копилов И. П. и др. Проектиране на електрически машини, София, Техника, 1988; 3. Тодоров Г., С. Шишкова, Г. Ганев. Ръководство – работна тетрадка по проектиране на електромеханични устройства, част първа – Трифазен асинхронен двигател, София, 2004; 4. Голдберг О. и др. Проектирование электрических машин, М., 2001; 5. Кацман М., Расчет и конструирование электрических машин, М., Энергоатомиздат, 1984; 6. Волдек А. Электрически машини, София, Техника, 1978; 7. Норенков И. П., Автоматизированное проектирование, М., Высшая школа, 2000; 8. Nasar S. Schaum's outline of theory and problems of electric machines and electromechanics, McGraw – Hill, 1998, ISBN 0-07-045994-0; 9. Mukerji S. Electromagnetics for Electrical Machines, CRC Press, London, 2015, ISBN 978-1-4987-0915-6.

COURSE DESCRIPTION

Course title: Economics of the Electrical Industry	Code: BpEE12	Semester: 6
Type of teaching: Lectures (L) Seminars (S) Laboratory practicals (LP) Extracurricular activities (ECA)	Teaching hours per semester: L – 30 hours S – 0 hours LP – 0 hours ECA – 90 hours	Number of credits: 4

LECTURER:

Prof. Toni Mihova PhD (FME), tel: 0888 42 45 70, e-mail: mihova@tu-plovdiv.bg, Technical University of Sofia, Plovdiv Branch

COURSE STATUS IN THE CURRICULUM: Compulsory course in the Bachelor degree curriculum of 'Electrical Engineering' in 5.2 'Electrical Engineering, Electronics, Automation' Professional field of study, 5. STE (Science, Technology, Engineering) Higher Education Area of study

COURSE AIMS AND OBJECTIVES: The course intends to provide students with a thorough grounding and understanding of the basic terms and concepts of the Electrical Industry Economics, the changes in business activities as well as in the nature and characteristics of production and economic processes in the electrical industry, the ways of maintaining proper efficiency of business activities, financial stability and solvency of enterprises in the electrical industry.

COURSE DESCRIPTION: The course comprises the following main topics – Major Characteristics of the Electrical Industry Economics, Business Environment of the Electricity Enterprise, Equity and Assets of the Electricity Enterprise, Material Economy, Human Resources of the Electricity Enterprise, Costs and Costing, Pricing, Marketing and Sales, Efficiency of Production Economic Activity and Electricity Enterprise Financing.

PREREQUISITES: Basic knowledge of Arts, Maths, Management as well as economic, engineering, technology and technical subjects

TEACHING METHODS: Lectures aided by multimedia tools; active teaching methods continuously engaging students

ASSESSMENT METHOD: Continuous assessment based on 3 marks signifying students' score on: a mid-term test covering 6 topics – 30%, a presentation on a topic previously selected by students – 30% and an end-of-term test – 40%

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY

1. Panos Konstantin , Margarete Konstantin, Power and Energy Systems Engineering Economics, Springer, 2018
2. Partha Chatterjee, Economics for Engineers, Kindle Edition, 2014
3. I. Fraser, Niall M., Engineering economy. Pearson Education, Inc. , 2012
4. R. Panneerselvam, Engineering Economics, NEW DELHI-110001,
5. Contemporary Engineering Economics, Chan S. Park, Pearson Education, Inc.,
6. Димитър Дончев, Цонка Лалева, Даниела Манчева, Икономика на предприятието Мартилен, София, 2020
7. Събина Ракарова, Анета Еленкова, Индустириална икономика, НБУ, 20128.
8. Георгиев Ив. И др. Икономика на предприятието, Университетско издателство "Стопанство", София, 2008.

DESCRIPTION OF THE COURSE

Name of the course: Sport	Code: FaSPR05	Semester: 5
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S) Self-Study (SS)	Hours per semester: L – 0 hours S – 0 hours SS – 30 hours	Number of credits: 1

LECTURER(S):

Sen. Lect. Daniel Vladimirov, PhD (FEA), tel.: 032 659 646, e-mail: danielv@tu-plovdiv.bg

Sen.Lect. Petar Doganov, PhD (FEA), tel.: 032 659 648, e-mail: pdoganov@tu-plovdiv.bg

Sen.Lect. Boris Spasov, PhD (FEA), tel.: 032 659 647, e-mail: boris_spasov@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Facultative subject from the curriculum for training of students to obtain Bachelor's degree, specialty “Automation, Information and Control Systems”, “Electrical Engineering”, “Design and programming of electronic systems” Professional orientation 5.2 Electrical Engineering, Electronics and Automation, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: Targeted at further developing of students’ physical activities, skills and hygiene habits through effective methods of physical education, improving their mental and physical performance.

DESCRIPTION OF THE COURSE: The knowledge and skills in Physical Education and Sports develop a wide range of motor skills and habits, help the hardening of the body and contribute to the moral development of students. The enhancement of physical skills is carried out through:

1. General Physical Preparedness (GPP) – in these seminars the students develop a wide range of motor skill and habits; work to improve strength, speed, endurance, flexibility, structure and skill; increase resistance to unfavourable environmental factors; develop their physical qualities and experience.
2. Sports-Specific Physical Preparedness (SPP) – students improve their sport skills and habits in a specific sport and gain experience through participation in competitions; work to improve strength, speed, endurance, flexibility, structure and skill; increase resistance to unfavourable environmental factors; develop their physical qualities and experience.

PREREQUISITES: The curricula presume the minimum of knowledge and skills acquired at secondary school.

TEACHING METHODS: Seminars in accordance with the curriculum in PE and Sport.

METHOD OF ASSESSMENT: Evaluation is based on functional tests at the end of semester. Lecturer’s signature is required at the end of semester.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Владимиров В. Туризм и ориентиране. Методическо ръководство за студентите от ТУ София, филиал Пловдив. Издателство на ТУ - София. 2010.

DESCRIPTION OF THE COURSE

Name of the course: Sport	Code: FaSPR06	Semester: 6
Type of teaching: Lectures (L) Laboratory work (LW)/ Tutorials (T) Self-Study (SS)	Hours per semester: L – 0 hours T – 0 hours SS – 30 hours	Number of credits: 1

LECTURER(S):

Sen. Lect. Daniel Vladimirov, PhD (FEA), tel.: 032 659 646, e-mail: danielv@tu-plovdiv.bg

Sen.Lect. Petar Doganov, PhD (FEA), tel.: 032 659 648, e-mail: pdoganov@tu-plovdiv.bg

Sen.Lect. Boris Spasov, PhD (FEA), tel.: 032 659 647, e-mail: boris_spasov@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Facultative subject from the curriculum for training of students to obtain Bachelor's degree, specialty “Automation, Information and Control Systems”, “Electrical Engineering”, “Design and programming of electronic systems” Professional orientation 5.2 Electrical Engineering, Electronics and Automation, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: Targeted at further developing of students’ physical activities, skills and hygiene habits through effective methods of physical education, improving their mental and physical performance.

DESCRIPTION OF THE COURSE: The knowledge and skills in Physical Education and Sports develop a wide range of motor skills and habits, help the hardening of the body and contribute to the moral development of students. The enhancement of physical skills is carried out through:

1. General Physical Preparedness (GPP) – in these seminars the students develop a wide range of motor skill and habits; work to improve strength, speed, endurance, flexibility, structure and skill; increase resistance to unfavourable environmental factors; develop their physical qualities and experience.
2. Sports-Specific Physical Preparedness (SPP) – students improve their sport skills and habits in a specific sport and gain experience through participation in competitions; work to improve strength, speed, endurance, flexibility, structure and skill; increase resistance to unfavourable environmental factors; develop their physical qualities and experience.

PREREQUISITES: The curricula presume the minimum of knowledge and skills acquired at secondary school.

TEACHING METHODS: Seminars in accordance with the curriculum in PE and Sport.

METHOD OF ASSESSMENT: Evaluation is based on functional tests at the end of semester. Lecturer’s signature is required at the end of semester.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Владимиров В. Туризм и ориентиране. Методическо ръководство за студентите от ТУ София, филиал Пловдив. Издателство на ТУ - София. 2010.

COURSE CHARACTERISTICS

Name of the Course: Project Management	Code: Fa BpEE01	Semester: 6
Type of Teaching: Lecturers(L), Laboratory work(LW)	Hours per semester: L - 15 hours, LW – 30 hours	Number of credits: 3

LECTURERS: Assoc. Prof. G. Georgiev, PhD, e-mail: georgi@tu-plovdiv.bg, tel.: 032/659706

Technical University – Sofia, Plovdiv Branch

COURSE STATUS IN THE CURRICULUM: Free elective for the full-time Bachelor Degree students of ‘Electrical Engineering’ at the Faculty of Electronics and Automation in 5.2 ‘Electrical Engineering, Electronics, Automation’, Professional field of study. 5 Technical Sciences.

OBJECTIVES OF THE COURSE: Upon completion students will have basic knowledge of the Project Management processes and will acquire skills for identifying project ideas and turning them into project proposals.

DESCRIPTION OF THE COURSE: The course is focused on identifying project ideas and turning them into project proposals. Main topics are: Definitions of Project management, Projects and types of projects; The project as an instrument for meeting organizational needs and attracting funding; Methods and techniques for project development; Main elements of the project cycle and the project proposal; Developing project activities and identifying necessary resources; Project budgeting; Project implementation and management; Project teambuilding.

PREREQUISITES: none.

TEACHING METHODS: Lectures with slides and topic discussions; lab work including group case study discussions and an individual assignment with a powerpoint presentation defence.

METHOD OF ASSESSMENT: Final written exam (60%) and individual assignment defence(40%).

LANGUAGE OF INSTRUCTION: English

LITERATURE RECOMMENDED:

1. Watts, A. Project Management. Victoria, B.C.: BCcampus., 2014.
2. A Guide to the Project Management Body of Knowledge (PMBOK Guide), Sixth Edition 2017
3. Stephen Barker and Rob Cole, Brilliant Project Management: What the best project managers know, do, and say; Pearson 2014
4. Joseph Heagney, Fundamentals of Project Management, Fourth Edition; 2012 American Management Association
5. Kemp, Sid “Project management- made easy” 2006.
6. Сборник материали на Програма „Партньори за проекти“ на Център по предприемачество към Технически университет – София, филиал Пловдив, 2005
7. Иванов, Вл. „Ръководство за подготвяне на бизнес план“ на Център по предприемачество към Технически университет – София, филиал Пловдив, 2010
8. Георгиев Г., Танева П. „Наръчник за подготовка на проекти“, София, ФРМС, 2004