DESCRIPTION OF THE COURSE

Name of the course **Artificial Intelligence**	Code: **BpE15**	Semester: **7**
Type of teaching: Lectures and laboratory work	Lessons per semester: L – 30 hours; LW – 20 hours	Number of credits: **5**

LECTURER: Assoc. Prof. Ph.D. Sevil Ahmed (FEA) – tel.: 659 585,
email: sevil.ahmed@tu-plovdiv.bg Technical University of Sofia, Branch at Plovdiv

COURSE STATUS IN THE CURRICULUM: Compulsory for the student's specialty "Electronics" BEng programme of the Faculty of Electronics and Automatics.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is to make students familiar with the basics of modern artificial intelligence techniques. At the end of this course, students will be able to design and implement intelligent approaches and algorithms with application on designing, testing and implementing electronic circuits and devices.

DESCRIPTION OF THE COURSE: The main topics concern basic principles of computational intelligence. The main topics introduce students to artificial neural networks and fuzzy logic, which are the basis of artificial intelligence systems. Therefore, their structural and functional features are considered. Students get acquainted with the possibilities of applying intelligent algorithms for solving basic tasks for the systems with artificial intelligence such as image recognition, data processing and visualization, control of automated and robotic systems, solutions for smart homes.

PREREQUISITES: Higher Mathematics, Computer Simulation, Control Theory I, II, Nonlinear Control Systems, Identification.

TEACHING METHODS: Lectures using slides; laboratory work using MATLAB/SIMULINK simulation environment, work in teams, protocols, course work.

METHOD OF ASSESSMENT: Written exam. The final grade for the course is based on the exam results (80% in total) and the assessment of the course work (20%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1. Petrov M., A. Topalov, A. Taneva, N. Shakev. Lecture notes in Artificial Intelligence Methods in Control Systems. Part I. Fuzzy Logic and Control (in Bulgarian). Edition of theTechnical University - Sofia , 2009, p. 168. ISBN 978-954-438-801- 0. **2.** A. Topalov, Petrov M., N. Shakev, A. Taneva. Lecture notes in Artificial Intelligence Methods in Control Systems. Part II. Application of Neural Networks (in Bulgarian). Edition of theTechnical University - Sofia , 2010 **3**. F. O. Karray, C. de Silva. Soft Computing and Intelligent Systems Design. Theory, Tools and Applications, Addison Wesley, 2004. **4**. J. C. Principe, N. R. Euliano, W. C. Lefebvre. Neural and Adaptive Systems. Fundamentals Through Simulations. John Wiley & Sons, Inc., 2000. **5**. Z. Michalewicz. Genetic Algorithms + Data Structures = Evolution Programs. Third Ed., Springer-Verlag, 1995. **6**. O. Castillo, P. Melin. Soft Computing for Control of Non-Linear Dynamical Systems, Physica-Verlag, 2001.

DESCRIPTION OF THE COURSE

Name of the course: **Data acquisition systems – methods and techniques**	Code: **BpE16.1**	Semester: **7**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 20 hours	Number of credits: **5**
Course project (CP) - optional	Code: **BpE21**	Number of credits: **2**

LECTURER(S):
Assoc. Prof. Eng. Boyko Petrov, PhD (FEA), tel.: 960, e-mail: bpetrov@tu-plovdiv.bg
Technical University of Sofia, Branch Plovdiv

COURSE STATUS IN THE CURRICULUM: Elective subject from the curriculum / curricula for training of students in Bachelor's degree, specialty Electrical, Electronics and Automation, Professional orientation 5.2, Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: At the end of the course the course students know the theoretical foundations, principles of design, implementation and use of modern modules, devices and systems for data acquisition and digital processing of information in every day life, industry and research.

DESCRIPTION OF THE COURSE: Main topics: Classical and special methods for digital processing of one-dimensional and two-dimensional signals: Digital filtration, Spectral and Cepstral analysis, Window Fourier transform, Scanning analysis; Special methods for ADC – sigma-delta modulation, synchronous. The architectural features and methods for analysis and design of modules and systems based on digital signal processors (DSP) are considered. The studied material is directed and illustrated in the processing of biomedical, audio and video signals.

PREREQUISITES: Good preparation in Mathematics, Physics, Signals and Systems, Microprocessor Technique and Programming

TEACHING METHODS: Lectures, using slides, case studies, laboratory, work in teams, protocols and course project description preparation and defence.

METHOD OF ASSESSMENT: Written exam, forming 70%, defense of laboratory (30%), course project on individual task and defense

INSTRUCTION LANGUAGE: Bulgarian/English

BIBLIOGRAPHY:
1. Макс, Ж., Методы и техника обработки сигналов при физических измерениях, М.: Мир, 1983, I и II. 2. Ташев, Ив., Методи, устройства и системи за събиране и преобразуване на информация, Учебник за дистанционно обучение при ТУ София. 3. Опенхайм, Ал., Сигнали и системи, С.: Техника, 1992. 4. Иванов, Р., Ив.Ташев, Б.Петров, Методи и средства за събиране и обработка на информация. Ръководство за лабораторни упражнения, ТУ София, 1993; 5. Lyons R.G., "Uderstanding of digital signal processing", Prentice Hall PTR Publication, NJ 07458, ISBN 0-201-63467-8; 6. Crane R., "A Simplified Approach To Image Processing- Classical And Modern Techniques in C", Prentice Hall PTR Publication, NJ 07458, ISBN 0-13-226416-1;

DESCRIPTION OF THE COURSE

Name of the course: **Real-time control systems**	Code: **BpE16.2**	Semester: **7**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 20 hours	Number of credits: **5**
Course project (CP) - optional	Code: **BpE21**	Number of credits: 2

LECTURER(S):
Assoc. Prof. Eng. Boyko Petrov, PhD (FEA), tel.: 659760,e-mail: bpetrov@tu-plovdiv.bg
Technical University of Sofia, branch Plovdiv

COURSE STATUS IN THE CURRICULUM: Elective subject from the curriculum / curricula for training of students in Bachelor's degree, speciality Electrical, Electronics and Automation, Professional orientation 5.2, Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: After subject completion the students know a theoretical basis, methods of development and realization of real-time microprocessor based single-devices and systems for industrial control and measuring applications.

DESCRIPTION OF THE COURSE: The main topics concern: The circumstance of real-time microprocessor based applications; Mathematical methods of function response descretization; Basic parts and their parameters determination - ADC, DAC, memory, ALU, period of sampling, type of microprocessor; Software development of real-time applications - calculations acceleration methods. The study course material is located to the industrial control and measuring applications.

PREREQUISITES: Good preparation of Mathematics, Physics, Control Theory, Signals and systems, Microprocessors and Firmware development skills

TEACHING METHODS: Lectures, using slides, case studies, laboratory work, work in teams, protocols description preparation and defence.

METHOD OF ASSESSMENT: Students develop an individual project within the semester, for which after defense they receive an ongoing assessment.

INSTRUCTION LANGUAGE: Bulgarian/English

BIBLIOGRAPHY: 1.Петров Бойко Б. - „Компютризирани устройства и системи за работа в реално време“, Пловдив, 2013 г. - Лекционни записки, ISBN : 978-619-167-040-6 2. B.C.Kuo - Discrete Data Control Systems, Prentice-Hall Inc. Englewood Cliffs, New Jersey,1991 3. Paul Katz - Digital Control using Microprocessors, Technion - Israel Institute of Technology,1991, ISBN 0-13-212191-3 4.Marc Davio, Jean-Pierre Deschamps, Andre Thayse – Discrete and Switching Functions, Advanced Book Program, Georgi Publishing Co and McGraw-Hill Inc., 1984, ISBN 0-07-015509-7. 5. Острем К., Виттенмарк Б. Системы управления с ЭВМ, Москв, Мир,1987

DESCRIPTION OF THE COURSE

Name of the course: **Power electronic converters**	Code: **BpE17.1**	Semester: 7
Type of teaching: Lectures(L) Laboratory work (LW)/Tutorials (T) Course work (CW)	Hours per semester: L – 30hours T– 15 hours LW – 20 hours	Number of credits: 5
Course project (CP)- optional	Code: **BpE21**	Number of credits: **2**

LECTURER(S):
Assoc. Prof. Eng. Tsvetana Grigorova, PhD (FEA), tel.: 032 659 711, e-mail: c_gr@tu-plovdiv.bg
Technical University of Sofia

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

AIMS AND OBJECTIVES OF THE COURSE: The aims and objectives of the course are to teach students the types of power electronic converters, their basic power circuits and control systems. The students learn the modern circuits and theory, methods for analyses and design of power electronics circuits.

DESCRIPTION OF THE COURSE: The main topics concern: Power converters: definitions, classification and converter topologies; methods of analysis; characteristics, parameters and features of power semiconductor devices; Commutations techniques; Single-phase controlled rectifiers; Three-phase controlled rectifiers; Converters in rectifier and inverter mode; AC switches and regulators; Autonomous inverters - current source inverters, voltage source inverters, resonant inverters - analysis of the main circuits; Circuit topologies of autonomous inverters; Regulation and stabilization of voltage, current and power in autonomous inverters; Functional block-diagrams and principles of control systems; Drivers for control of MOS transistors and IGBT - International Rectifier (IR21xx), Microchip, IXYS (IXDDxx), Semikron, etc.; PWM and Resonant IC controllers.

The *seminars* give students knowledge in analysis and methods for designing the listed types of converters. In addition, *laboratory exercises* expand students' knowledge and provide opportunities for independent work.

PREREQUISITES: Electronic and semiconductor devices, Theory of electrical engineering, Electronic circuits theory, Power supplies, Analogue circuits, Digital electronics.

TEACHING METHODS: Lectures, using slides, case studies, laboratory work, work in teams, protocols preparation and defence, demo-programs.

METHOD OF ASSESSMENT: The exam consists of written answers to 3 of 5 questions, cases or tasks that productively test the student's knowledge and skills (80 %), laboratories (20 %).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: Main literature**:** 1. Горанов, П. Градивни елементи в силовата електроника, ТУ-София, 2017, ISBN: 978-619-167-3005-6; 2. Бобчева, М., С.Табаков, П. Горанов. Преобразувателна техника, Техника, София, 2002 ISBN: 954-438-206-2; 3. Бобчева, М., П.Горанов, Г.Кънов, Цв. Григорова,. Ръководство за лабораторни упражнения по основи на преобразувателната техника. 2012, ISBN 978-954-9549-64-5; Additional literature: 1. Анчев, М. Силови електронни устройства, Изд. ТУ-София, 2019, ISBN: 978-619-167-373-5; 2. Бобчева, М. Н. Градинаров, Г. Малеев, Е. Попов, М. Анчев. Силова електроника, С., Изд.ТУ-София, 2001, ISBN: 954-438-212-7; 3. Mohan, N. Power

electronics, A First Course. John Wiley & Sons, 2012; ISBN 978-1-118-07480-0, 4. OrCad Pspice A/D Reference Manual, 2015

DESCRIPTION OF THE COURSE

Name of the course: **Power electronics**	Code: **BpE17.2**	Semester: 7
Type of teaching: Lectures(L) Laboratory work (LW)/Tutorials (T) Course work (CW)	Hours per semester: L – 30hours T– 15 hours LW – 20 hours	Number of credits: 5
Course project (CP)- optional	Code: **BpE21**	Number of credits: **2**

LECTURER(S):
Assoc. Prof. Eng. Tsvetana Grigorova, PhD (FEA), tel.: 032 659 711, e-mail: c_gr@tu-plovdiv.bg
Technical University of Sofia

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

AIMS AND OBJECTIVES OF THE COURSE: The aims and objectives of the course are to teach students the types of power electronic converters, their basic power circuits and control systems. The students learn the modern circuits and theory, methods for analyses and design of power electronics circuits.

DESCRIPTION OF THE COURSE: The main topics concern: Power converters: definitions, classification and converter topologies; methods of analysis; characteristics, parameters and features of power semiconductor devices; Commutations techniques; Single-phase controlled rectifiers; Three-phase controlled rectifiers; Converters in rectifier and inverter mode; AC switches and regulators; Autonomous inverters - current source inverters, voltage source inverters, resonant inverters - analysis of the main circuits; Circuit topologies of autonomous inverters; Regulation and stabilization of voltage, current and power in autonomous inverters; Functional block-diagrams and principles of control systems; Drivers for control of MOS transistors and IGBT; PWM and Resonant IC controllers.

The *seminars* give students knowledge in analysis and methods for designing the listed types of converters. In addition, *laboratory exercises* expand students' knowledge and provide opportunities for independent work.

PREREQUISITES: Electronic and semiconductor devices, Theory of electrical engineering, Electronic circuits theory, Power supplies, Analogue circuits, Digital electronics.

TEACHING METHODS: Lectures, using slides, case studies, laboratory work, work in teams, protocols preparation and defence, demo-programs.

METHOD OF ASSESSMENT: The exam consists of written answers to 3 of 5 questions, cases or tasks that productively test the student's knowledge and skills (80 %), laboratories (20 %).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: Main literature**:** 1. Анчев, М. Силови електронни устройства, Изд. ТУ-София, 2019, ISBN: 978-619-167-373-5; 2. Горанов, П. Градивни елементи в силовата електроника, ТУ-София, 2017, ISBN: 978-619-167-3005-6; 3. Бобчева, М., С.Табаков, П. Горанов. Преобразувателна техника, Техника, София, 2002 ISBN: 954-438-206-2; 4. Бобчева, М., П.Горанов, Г.Кънов, Цв. Григорова,. Ръководство за лабораторни упражнения по основи на преобразувателната техника. 2012, ISBN 978-954-9549-64-5; Additional literature: 1. Бобчева, М. Н. Градинаров, Г. Малеев, Е. Попов, М. Анчев. Силова електроника, С., Изд.ТУ-София, 2001, ISBN: 954-438-212-7; 2. Mohan, N. Power electronics, A First Course. John Wiley & Sons, 2012; ISBN 978-1-118-07480-0, 3. OrCad Pspice A/D Reference Manual, 2015

DESCRIPTION OF THE COURSE

Name of the course **Medical electronics**	Code: **BpE18.1**	Semester: **7**
Type of teaching: Lectures (L) Laboratory work (LW),	Hours per semester: L – 30 hours; LW – 20 hours;	Number of credits: **5**
Course project (CP) - optional	CP - **BpE21**	Number of credits: **2**

LECTURER:

Prof. Eng. Galidiya Petrova, PhD (FEA), tel.: 659 576, e-mail: gip@tu-plovdiv.bg,
Technical University of Sofia, Plovdiv branch, Deptartment of Electronics

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

AIMS AND OBJECTIVES OF THE COURSE: At the end of the course the students are expected to be able to apply the approaches, methods and technical means for analysis and synthesis of electronic devices and devices with specific application in the medical electronic equipment, to acquire new knowledge and opportunities in this subject area.

DESCRIPTION OF THE COURSE: The course is designed to acquaint students with the theoretical foundations and the principles of action of modern medical devices for the registration of biopotentials. The characteristics and parameters of the biopotentials generated by the heart, the cerebral cortex and the muscles in the patient's body, the leads systems, the characteristics and the technical requirements of the apparatus for their reliable amplification and registration are studied. The circuit diagrams of the apparatuses, as well as the principal schemes and specific features of the individual blocks, are considered. Students are acquainted with various clinical applications of Bioimpedance Measurements, specificities and technical requirements to individual blocks of aparatus as well as specific schematic solutions. The impact of electric currents on human tissues and organs are studied. The methods and devices for direct current, low and medium frequency alternating currents and current pulses therapy are discussed.

PREREQUISITES: Good fundamental knowledge in the courses: Analogue and digital electronics, Microprocessors.

TEACHING METHODS: Lectures using multimedia presentations, laboratory exercises with protocols containing experimental results and oral defense of course project with description.

METHOD OF ASSESSMENT: Two hours written exam at the end of semester in the form of a test with open questions. The final grade for the course is based on the exam results (80%) and work on laboratory exercises (20%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:

1. Petrova G., Medical electronic equipment, 2015, TU-Sofia; 2. Petrova G., 1998, Introduction to Biological Signal Processing, Inter-University Centre for Education in Medical Radiation Physics and Engineering.; 3. Carr J. Brown J., 1981, Introduction to Biomedical Equipment Technology, *John Wiley&Sons*.; 4. Metting Van Rijn, Peper A., Grimbergen C.A, 1990, 'High-

quality recording of bioelectrical events, Part 1 Interference reduction, theory and practice', *Med. Biol. Eng. Comput.*, 28, p.389-397.

DESCRIPTION OF THE COURSE

Name of the course **Biomedical engineering**	Code: **BpE18.2**	Semester: **7**
Type of teaching: Lectures (L) Laboratory work (LW),	Hours per semester: L – 30 hours; LW – 20 hours;	Number of credits: **5**
Course project (CP) - optional	CP - **BpE21**	Number of credits: **2**

LECTURER:

Prof. Eng. Galidiya Petrova, PhD (FEA), tel.: 659 576, e-mail: gip@tu-plovdiv.bg,
Technical University of Sofia, Plovdiv branch, Deptartment of Electronics

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

AIMS AND OBJECTIVES OF THE COURSE: At the end of the course the students are expected to be able to apply the approaches, methods and technical means for analysis and synthesis of electronic devices and devices with specific application in the medical electronic equipment, to acquire new knowledge and opportunities in this subject area.

DESCRIPTION OF THE COURSE: The course is designed to acquaint students with the theoretical foundations and the principles of action of modern medical devices for the registration of bio-potentials, impedance-cardiography and low-frequency physiotherapy. The characteristics and parameters of the bio-potentials generated by the heart, the cerebral cortex and the muscles in the patient's body, the leads systems, the characteristics and the technical requirements of the apparatus for their reliable amplification and registration are studied. The circuit diagrams and principal schemes of the apparatuses, and specific features of the individual blocks, are considered. The students are acquainted with clinical applications of bio-impedance measurements, specificities and technical requirements to individual blocks of apparatus, as well as specific schematic solutions. The impact of electric currents on human tissues and organs are studied. The methods and devices for direct current, low and medium frequency alternating currents and current pulses therapy are discussed.

PREREQUISITES: Good fundamental knowledge in the courses: Analogue and digital electronics, Microprocessors.

TEACHING METHODS: Lectures using multimedia presentations, laboratory exercises with protocols containing experimental results and oral defense of course project with description.

METHOD OF ASSESSMENT: Two hours written exam at the end of semester in the form of a test with open questions. The final grade for the course is based on the exam results (80%) and work on laboratory exercises (20%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:

1. Petrova G., Medical electronic equipment, 2015, TU-Sofia; 2. Petrova G., 1998, Introduction to Biological Signal Processing, Inter-University Centre for Education in Medical Radiation Physics and Engineering.; 3. Carr J. Brown J., 1981, Introduction to Biomedical Equipment Technology, *John Wiley&Sons*.; 4. Metting Van Rijn, Peper A., Grimbergen C.A, 1990, 'High-

quality recording of bioelectrical events, Part 1 Interference reduction, theory and practice', *Med. Biol. Eng. Comput.*, 28, p.389-397.

DESCRIPTION OF THE COURSE

Name of the course: **Fundamentals of programmable logic controllers**	Code: **BpE19.1**	Semester: **7**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 20 hours	Number of credits: **4**

LECTURER(S):
Assoc. Prof. Eng. Krum Kutryanski, PhD (FEA), tel.:032 695 585 526, e-mail: kkutryanski @ tu-plovdiv.bg
Assoc. Prof. Eng. Albena Taneva, PhD (FEA), tel.: 032 659 585, e-mail: altaneva@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Elective course for students in the "Electronis, BEng program of the Faculty of Electronics and Automation at the Technical University of Sofia, branch Plovdiv. Professional orientation 5.2 Electrical engineering, electronics and automation, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course to familiarize students with fundamentals and knowledge in programmable logic controller applications. Both programming trainee and input-output device equipment in the frame of control system, are included. At the end of the course the students will be able to understand, to develop user programs for programmable logic controllers, wired to the separate laboratory set up.

DESCRIPTION OF THE COURSE:

The subject of the course are different software environments and hardware of the programmable logic controllers. The main topics concern: Discrete (relay) control. Logical Functions. Functional fully systems. Logical elements and devices in the control systems. History of the Programmable Logic Controllers (PLCs). Applications of PLCs. Structure and principles of operation. Connection of PLCs – supply, sensors, actuators. Programming for PLCs, structure of the programme, methods of representation. Design of small control systems. Practical work with Programmable Logic Controllers.

PREREQUISITES: Industrial elements of automation, Data and signal processing, Programming of industrial controllers.

TEACHING METHODS: Lectures, using slides, case studies, laboratory work with reports. Practical exercises with laboratory set up with programmable logic controllers of OMRON, SIEMENS, Schneider, Mitsubishi and Panasonic..

METHOD OF ASSESSMENT: Temporary evaluation at the end of the semester (70%), laboratories (30%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1.Petruzella F., Programmable Logic Controllers, Fifth Edition, Publisher: McGraw-Hill Education, 2017, 2.Тодоров А., С. Йорданова, С. Джиев, В. Сгурев. Логическо управление на процеси. С.,Технически Университет, 2001, 3. UnityPro, Ръководство за програмиране на Schneider, 2012, 4. FPWIN Pro, Ръководство за програмиране на Panasonic, 2012, 5. SIMATIC S7-300 CPU 31xC: Specifications Manual, Technical data of the integrated I/O, 2010, 6. SIMATIC Programming with STEP 7, (Manual), Siemens, 2010. 7.Melsec FX Family, Programmable Logic Controllers, Beginner's Manual, Mitsubishi Electric, Art.no.:166388, Version B, 2007.

DESCRIPTION OF THE COURSE

Name of the course **Automation of electronic production**	Code: **BpE19.2**	Semester: 7
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 20 hours	Number of credits: **4**

LECTURER:

Assoc. Prof. Ph.D. Svetoslav Ivanov (FEA), tel.: 032 659720, email: bluflam@tu-plovdiv.bg Technical University of Sofia, branch Plovdiv

COURSE STATUS INTHE CURRICULUM: Freely elective course 4 from list 2 for electronics students, bachelor's degree.

AIMS AND OBJECTIVES OF THE COURSE: To introduce the students to the main tasks of automation of electronic production and with the methods for control and diagnostics of electronic elements and devices. At the end of the course the student will know the basic principles for building flexible automated systems; the organizational structure of the electronic production and will have knowledge of functional diagnostics of analogue and digital electronic devices.

DESCRIPTION OF THE COURSE: The discipline is fundamental to the knowledge and skills in the field of automation of electronic production. The course covers issues related to flexible automated manufacturing systems, digital and program control, programmable logic (industrial) controllers, interfaces and local networks used for automation of production, the structure of electronic production and diagnostics of electronic products.

PREREQUISITES: Control Theory, Analog Circuits, Digital Circuits, Measurements in Electronics, Electronic control and command devices.

TEACHING METHODS: Lectures using a multimedia projector, laboratory exercises with protocols.

METHOD OF ASSESSMENT: Written exam**.** (70%), laboratory exercises (30%) .

INSTRUCTION LANGUAGE; Bulgarian

BIBLIOGRAPHY:

1. Ovcharov S., Automation of electronic production, Technics, S., 2004.
2. Stoilov G., Quality control in the electronic industry, Auto Spectrum, Plovdiv, 1998.
3. Dally J, W.F.Riley, K.G. McConnell, Instrumentation for Engineering easurement, J.Wiley&Sons, inc., N.Y., 1993
4. Taguchi Genichi and Yu-In Wu , Introdaction of off- Line Quality Control, Central Japan Quality Control Assoeiation.

DESCRIPTION OF THE COURSE

Name of the course: **Sensors and sensor devices**	Code: **BpE20.1**	Semester: 7
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 20 hours	Number of credits: 4

LECTURER(S):
Assist. Prof. Eng. Ivan Maradzhiev, PhD (FEA), tel.: 032 659 776, e-mail: iv_mar@tu-plovdiv.bg
Technical University of Sofia

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

AIMS AND OBJECTIVES OF THE COURSE: During the course the students acquire specialized knowledge about construction and operating principle of different types of sensors and sensor systems.

DESCRIPTION OF THE COURSE: The main topics concern: Types and classifications of sensors and sensor systems; Conversion of non-electrical quantities into an electrical signal; Power-management techniques for sensor systems; Energy harvesting for low-power sensor systems; Temperature sensors; Humidity sensors; Speed and acceleration measurement; Mass, torque, force and strain measurement; Optical sensors; Motion detector using passive infrared sensors, Magnetic field sensors; Hall sensors; Electromechanical sensors; Industrial sensors and control; Electromagnetic flowmeter; MEMS sensors; Digital gyroscope; Digital accelerometer; Composition Sensors; 4 to 20-mA current loop transmitter; Terahertz spectroscopy; GMR sensors; Internet of things;

PREREQUISITES: Mathematic, Physics, Semiconductor devices, Theoretical Electrical Engineering, Analogue electronics, Digital electronics, Electronics circuits theory, Microelectronics, Microprocessor techniques

TEACHING METHODS: Lectures and laboratory exercises in properly equipped laboratories. For the laboratory exercises are developed methodical manuals, templates, and laboratory models on topics, covered in the lectures.

METHOD OF ASSESSMENT: One assessment at the end of the semester (80%), laboratories (20%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Solomon S. Sensors. Handbook M. G. Hill 2010 ISBN 9780071605717; 2. Moris A. Measurement and instrumentation. Priciples. ISBN 0750650818 2001; 3. Sensor. Technology Handbook 2005 ISBN0750677295; 3. Webster J.G.T he measurment instrmentation and sensors. CRCPress LLC 1999 ISBN 084932145-X; 4. Semiconductor Sensors.Daate Handbook. SC17, Philips,1989; 5. Mukhopadhyay S., K. Jayasundera, O. Postalache, Modern Sensing Technologies, Springer International Publishing, 2019, ISBN 978-3-319-99539-7;978-3-319-99540-3

DESCRIPTION OF THE COURSE

Name of the course: **Sensors and actuators**	Code: **BpE20.2**	Semester: 7
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S)	Hours per semester: L – 30 hours S – 0 hours LW – 20 hours	Number of credits: **4**

LECTURER(S):
Assist. Prof. Eng. Ivan Maradzhiev, PhD (FEA), tel.: 032 659 776, e-mail: iv_mar@tu-plovdiv.bg
Technical University of Sofia

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

AIMS AND OBJECTIVES OF THE COURSE: Aim of the course is to provide electronics engineering students with detailed knowledge about the types of sensors and actuators in the electronic and mechatronic systems. The emphasis is laid upon the control systems analysis where the systems are described with discrete response curves.

DESCRIPTION OF THE COURSE: The course describes the particular features of control of parameters in mechatronic systems and possibility to react by different types of actuators. The course provides knowledge about special sensor integrated circuits, the realization of the connection between sensors, also some modern trends in the use of actuators are explained. Laboratory exercises reinforce the presented in lectures and aim at enhancing students' knowledge in the practical application of the presented theories.

PREREQUISITES: Mathematic, Physics, Semiconductor devices, Theoretical Electrical Engineering, Electronics, Microelectronics

TEACHING METHODS: Lectures, using slides, case studies, laboratory work in teams, protocols preparation and defence.

METHOD OF ASSESSMENT: One assessment at end of the semester (80%), laboratories (20%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Solomon S. Sensors. Handbook M. G. Hill 2010 ISBN 9780071605717; 2. Moris A. Measurement and instrumentation. Priciples. ISBN 0750650818 2001; 3. Sensor. Technology Handbook 2005 ISBN0750677295; 3. Webster J.G.T he measurment instrmentation and sensors. CRCPress LLC 1999 ISBN 084932145-X; 4. Semiconductor Sensors.Daate Handbook. SC17, Philips,1989; 5. Mukhopadhyay S., K. Jayasundera, O. Postalache, Modern Sensing Technologies, Springer International Publishing, 2019, ISBN 978-3-319-99539-7;978-3-319-99540-3

DESCRIPTION OF THE COURSE

Name of the course: Analysis, modelling and design of power converters	Code: **BpE22.1**	Semester: **8**
Type of teaching: Lectures(L), Laboratory work (LW) Course work (CW)	Hours per semester: L – 30hours LW – 20 hours	Number of credits: **5**

LECTURER(S):
Assoc. Prof. Eng. Tsvetana Grigorova, PhD (FEA), tel.: 032 659 711, e-mail: c_gr@tu-plovdiv.bg
Technical University of Sofia

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

AIMS AND OBJECTIVES OF THE COURSE: The aims and objectives of the course "Analysis, modelling and design of power converters" is to teach students on the fundamental theory for electromagnetic processes description, models, algorithms, applicable programs for analysis, modelling in the transient/steady-state mode of the electrical energy converters.

At the end of the course the students must have theoretical and practical knowledge on the main types of power electronic converters, their basic parameters and characteristics as well as methods of their investigation and computer simulation.

DESCRIPTION OF THE COURSE: "Analysis, modelling and design of power converters" gives the students' knowledge about bases analysis methods, investigation and design of the electrical energy converters. Because of the industrial applications and the related technical requirements of the different types of circuits, different algorithms for control of power devices and formation of output voltage and output current in are considered; series, parallel, series-parallel (LCC, LLC) resonant DC converters; methods for power regulation in resonant DC converters and specialized controllers for their control. The general principles of modelling power electronic devices and their realization with the help of computers are presented. Software products are used for the creation SPICE models and simulation analysis, building blocks and subsystems, links and interfaces, input and output, analogue behavioral modelling.

In addition, laboratory exercises expand students' knowledge and provide opportunities for independent work.

PREREQUISITES: Electronic circuits theory, Power supplies, Analogue circuits, Digital electronics, Electronic converters/Power electronics.

TEACHING METHODS: Lectures, using slides, case studies, laboratory work, work in teams, protocols preparation and defence, demo-programs.

METHOD OF ASSESSMENT: Students are required to take a written exam. Chosen questions are developing over themes included in conspectus (62 %), laboratories (18 %), course work (20%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: Main literature**:** 1.Григорова, Цв., Анализ, моделиране и проектиране на преобразователни устройства. ТУ- София, 2012, ISBN: 978-954-438-999-4, 2. Анчев, М. Силови електронни устройства, Изд. ТУ-София, 2019, ISBN: 978-619-167-373-5; Additional literature: 1. Mohan, N. Power electronics, A First Course. John Wiley & Sons, 2012; ISBN 978-1-118-07480-0, 2. Rashid, M., H. Rashid, SPICE for Power Electronics and Electric Power, CRC/Taylor & Francis, 2012, ISBN-13:978-1439860465, 3. OrCad Pspice A/D Reference Manual, 2015.

DESCRIPTION OF THE COURSE

Name of the course: Automated design of power electronic converters	Code: **BpE22.2**	Semester: 8
Type of teaching: Lectures(L), Laboratory work (LW) Course work (CW)	Hours per semester: L – 30hours LW – 20 hours	Number of credits: 5

LECTURER(S):
Assoc. Prof. Eng. Tsvetana Grigorova, PhD (FEA), tel.: 032 659 711, e-mail: c_gr@tu-plovdiv.bg
Technical University of Sofia

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

AIMS AND OBJECTIVES OF THE COURSE: The aims and objectives of the course "Automated design of power electronic converters" is to teach students on the fundamental theory for electromagnetic processes description, models, algorithms, applicable programs for analysis, modelling in the transient/steady-state mode of the electrical energy converters.

At the end of the course the students must have theoretical and practical knowledge on the main types of power electronic converters, their basic parameters and characteristics as well as methods of their investigation and computer simulation.

DESCRIPTION OF THE COURSE: The general principles of modelling power electronic devices and their realization with the help of computers are presented. Software products are used for the creation SPICE models and simulation analysis, building blocks and subsystems, links and interfaces, input and output, analogue behavioral modelling. The main attention is paid to the application of the automated design to solve specific technical problems in the autonomous inverters due to the significant complexity of their electromagnetic processes.

In addition, laboratory exercises expand students' knowledge and provide opportunities for independent work.

PREREQUISITES: Electronic circuits theory, Power supplies, Analogue circuits, Digital electronics, Electronic converters/Power electronics.

TEACHING METHODS: Lectures, using slides, case studies, laboratory work, work in teams, protocols preparation and defence, demo-programs.

METHOD OF ASSESSMENT: Students are required to take a written exam. Chosen questions are developing over themes included in conspectus (62 %), laboratories (18 %), and course work (20%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: Main literature**:** 1. Попов, Е., Анализ, моделиране и проектиране на преобразователни устройства (Автоматизирано проектиране на силови електронни устройства), 2005**,** ТУ- София, ISBN: 954-438-495-2, 2. Григорова, Цв., Анализ, моделиране и проектиране на преобразователни устройства. ТУ- София, 2012 ISBN: 978-954-438-999-4, 3. Анчев, М. Силови електронни устройства, Изд. ТУ-София, 2019, ISBN: 978-619-167-373-5; Additional literature: 1. Mohan, N. Power electronics, A First Course. John Wiley & Sons, 2012; ISBN 978-1-118-07480-0, 2. Rashid, M., H. Rashid, SPICE for Power Electronics and Electric Power, CRC/Taylor & Francis, 2012, ISBN-13:978-1439860465, 3. OrCad Pspice A/D Reference Manual, 2015.

DESCRIPTION OF THE COURSE

Name of the course: **Information systems with laser radiation**	Code: **BpE23.1**	Semester: **8**
Type of teaching: Lectures (L) Laboratory work (LW)/ Tutorials (S)	Hours per semester: L – 30 hours T – 0 hours LW – 20 hours	Number of credits: **5**

LECTURER(S):
Assoc. Prof. Eng. Boryana Pachedjieva, PhD (FEA), tel.: 659708, e-mail: pachedjieva@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Elective subject from the curriculum of students to obtain Bachelor's degree, specialty Electronics, Professional orientation 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 should be familiar with modern innovations in the field of information systems with laser radiation, as well as the trends in the development of these systems.

DESCRIPTION OF THE COURSE: The main topics concern: Types of information systems with laser radiation; Fiber optic radiation propagation - fiber optic modes; Localized and distributed energy losses in fiber optic information systems (SIS); Dispersion of code pulses - mode and chromatic dispersions, intersymbol disturbances; Methods and means for compensating for energy losses; Algorithm for general engineering design of SIS; Optical properties of the atmosphere - coefficients of scattering, absorption, extinction, intrinsic radiation; Propagation of laser radiation in the atmosphere; Radiation extinction; Photoelectron conversion mode; Generalized scheme of the transatmospheric laser information system (TALIS); Algorithm for engineering design of TALIS.

PREREQUISITES: Mathematics I – III, Signals and Systems, Semiconductor Devices.

TEACHING METHODS: Lectures, using slides, case studies, laboratory and course work, work in teams, protocols and course work description preparation and defence.

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

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Фердинандов, Е., Лазерното лъчение в радиотехниката, София, Техника, 1981; 2. Фердинандов, Е, Основи на оптоелектрониката – част I, София, Техника, 1993;3. Фердинандов, Е., Б. Пачеджиева, К. Димитров. Оптични комуникационни системи - аналитични описания, алгоритми за инженерен синтез, примерни проектирания., ТУ-София, филиал Пловдив, 2007; 4. Фердинандов, Е., Б. Пачеджиева, К. Димитров. Оптични комуникационни системи. Техника, София, 2007. 5. Фердинандов, Е., Б. Пачеджиева, К. Димитров. Влакнесто–оптични комуникационни системи. Техника, София, 2014. 6. Willebrand, H., B.S. Chuman, Free–Space Optics: Enabling Optical Connectivity in Today's Networks, Sams Publ., Indianapolis, 2002; 7. Hranilovic, S., Wireless Optical Communication Systems, Springer Science, Boston, 2005.

DESCRIPTION OF THE COURSE

Name of the course: **Optical communication systems**	Code: **BpE23.2**	Semester: **8**
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S)	Hours per semester: L – 30 hours S – 0 hours LW – 20 hours	Number of credits: **5**

LECTURER(S):
Assoc. Prof. Eng. Boryana Pachedjieva, PhD (FEA), tel.: 659708, e-mail: pachedjieva@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Elective subject from the curriculum of students to obtain Bachelor's degree, specialty Electronics, Professional orientation 5.2 Electrical engineering, electronics and automation, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is to acquaint the students with the basic quantitative dependencies between the parameters of the structural units and their relations with the qualitative indicators of the optical, transatmospheric and space optical communication systems; to learn the methods and algorithms for engineering design of optical, transatmospheric and space optical communication systems.

DESCRIPTION OF THE COURSE: The main topics concern: Fiber-optic communication systems-compaction of systems during and along the wavelength (TDM and WDM); basic qualitative indicators of multichannel digital fiber optic communication systems; algorithm for general engineering design of FOCS with WDM. Optical Communication Systems with Open Transmission Media (Transatmospheric OCS) - Transmission and propagation of optical radiation in an open transmission medium; statistical properties of the atmosphere - transparency fluctuations, turbulent fluctuations, mechanical vibrations, influence on Bit-Error Rate. Optical Communication Systems with Open Transmission Mediums (Space CCS) - a method of recording weak optical signals in photon-counting mode (RBF), analytical description of a telemetric space communication system with reception in RBF

PREREQUISITES: Mathematics I – III, Signals and Systems, Semiconductor Devices.

TEACHING METHODS: Lectures, using slides, case studies, laboratory and course work, work in teams, protocols and course work description preparation and defence.

METHOD OF ASSESSMENT: Two one-hour assessments at mid and end of semester (62%), laboratories (20%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Фердинандов, Е., Лазерното лъчение в радиотехниката, София, Техника, 1981; 2. Фердинандов, Е, Основи на оптоелектрониката – част I, София, Техника, 1993;3. Фердинандов, Е., Б. Пачеджиева, К. Димитров. Оптични комуникационни системи - аналитични описания, алгоритми за инженерен синтез, примерни проектирания., ТУ-София, филиал Пловдив, 2007; 4. Фердинандов, Е., Б. Пачеджиева, К. Димитров. Оптични комуникационни системи. Техника, София, 2007. 5. Фердинандов, Е., Б. Пачеджиева, К. Димитров. Влакнесто–оптични комуникационни системи. Техника, София, 2014. 6. Willebrand, H., B.S. Chuman, Free–Space Optics: Enabling Optical Connectivity in Today's Networks, Sams Publ., Indianapolis, 2002; 7. Hranilovic, S., Wireless Optical Communication Systems, Springer Science, Boston, 2005.

DESCRIPTION OF THE COURSE

Name of the course: **Fundamentals of network technologies**	Code: **BpE24.1**	Semester: **8**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours T – LW – 20 hours	Number of credits: **5**

LECTURER(S):
Prof. Eng. Grisha Spasov, PhD (FEA), tel.: 032 659724, e-mail: gvs@tu-plovdiv.bg
Assoc. Prof. Nikolay Kakanakov, PhD(FEA), tel.: 032 659725, e-mail: kakanak@tu-plovdiv.bg
Assoc.Prof. Mitko Shopov PhD(FEA), tel.: 032 659765, e-mail: mshopov@tu-plovdiv.bg
TU Sofia, Plovdiv Branch

COURSE STATUS IN THE CURRICULUM: Elective curricula for training of students to obtain Bachelor's degree, specialty Electronics, Professional orientation 5.2. Electrical engineering, electronics and automation, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The purpose of the course is to provide students with knowledge for Open Systems' Architecture – ISO OSI model, Data Communication Networks, Global network – Internet and TCP/IP client-server applications.

DESCRIPTION OF THE COURSE: Open Systems' Architectures – ISO OSI model. Structure and functions of OSI layers. Communication media. Methods of data transfer. Hardware aspects of data transfer – standard interfaces. Communication protocols. Data transfer control. Data link layer. LAN – topology. Media access control. Network layer. Internet Protocols. Transport Layer. TCP and UDP protocols, Sckets. Internet applications. DNS, FTP, SMTP, HTTP. Network operation systems. Client-server architecture – applications. Network administration.

PREREQUISITES: Introduction in Programing, Basic programming languages, Electrical Engineering, Semiconductor elements, Synthesis and Analysis of Algorithms

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

METHOD OF ASSESSMENT: Written exam with test on the theory and written work on problems. The final grade is constructed on the exam results (totally 80%) and the protocols from the laboratory work (20%).

INSTRUCTION LANGUAGE: Bulgarian/English

BIBLIOGRAPHY:
1. Grisha Spasov, Nikolay Kakanakov, Mitko Shopov, "Guide for laboratory work in Computer Networks", TU Sofia, 2011, ISBN: 978-964-438-790-7. 2. James F. Kurose, Keith W. Ross, "Computer Networking. A Top-Down Approach", 7th edition, Pearson, 2017, ISBN-13: 978-0-13-359414-0. 3. Andrew S. Tanenbaum , David J. Wetherall , "Computer Networks", 5th Edition, Prentice Hall, 2010, ISBN-10: 0132126958. 4. William Stallings, "Data and Computer Communications" ,10th Edition, Prentice Hall, 2013, ISBN-10: 0133506487.

DESCRIPTION OF THE COURSE

Name of the course: **Industrial network technologies**	Code: **BpE24.2**	Semester: **8**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours T – LW – 20 hours	Number of credits: **5**

LECTURER(S):
Prof. Eng. Grisha Spasov, PhD (FEA), tel.: 032 659724, e-mail: gvs@tu-plovdiv.bg
Assoc. Prof. Nikolay Kakanakov, PhD(FEA), tel.: 032 659725, e-mail: kakanak@tu-plovdiv.bg
Assoc.Prof. Mitko Shopov PhD(FEA), tel.: 032 659765, e-mail: mshopov@tu-plovdiv.bg
TU Sofia, Plovdiv Branch

COURSE STATUS IN THE CURRICULUM: Elective curricula for training of students to obtain Bachelor's degree, specialty Electronics, Professional orientation 5.2. Electrical engineering, electronics and automation, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The purpose of the course is to provide students with knowledge for Open Systems' Architecture – ISO OSI model, Data Communication Networks, Global network – Internet and TCP/IP client-server applications.

DESCRIPTION OF THE COURSE: Open Systems' Architectures – ISO OSI model. Structure and functions of OSI layers. Communication media. Methods of data transfer. Hardware aspects of data transfer – standard interfaces. Communication protocols. Data transfer control. Data link layer. LAN – topology. Media access control. Network layer. Internet Protocols. Transport Layer. TCP and UDP protocols, Sckets. Internet applications. DNS, FTP, SMTP, HTTP. Network operation systems. Client-server architecture – applications. Network administration.

PREREQUISITES: Introduction in Programing, Basic programming languages, Electrical Engineering, Semiconductor elements, Synthesis and Analysis of Algorithms

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

METHOD OF ASSESSMENT: Written exam with test on the theory and written work on problems. The final grade is constructed on the exam results (totally 80%) and the protocols from the laboratory work (20%).

INSTRUCTION LANGUAGE: Bulgarian/English

BIBLIOGRAPHY:
1. Grisha Spasov, Nikolay Kakanakov, Mitko Shopov, "Guide for laboratory work in Computer Networks", TU Sofia, 2011, ISBN: 978-964-438-790-7. 2. James F. Kurose, Keith W. Ross, "Computer Networking. A Top-Down Approach", 7th edition, Pearson, 2017, ISBN-13: 978-0-13-359414-0. 3. Andrew S. Tanenbaum , David J. Wetherall , "Computer Networks", 5th Edition, Prentice Hall, 2010, ISBN-10: 0132126958. 4. William Stallings, "Data and Computer Communications" ,10th Edition, Prentice Hall, 2013, ISBN-10: 0133506487.

DESCRIPTION OF THE COURSE

Name of the course: **Electronic technological devices**	Code: **BpE25.1**	Semester: **8**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 20 hours	Number of credits: **5**

LECTURER(S):
Assoc. Prof. Eng. Svetoslav Ivanov, PhD (FEA), tel.: 032/659 720, e-mail: blueflam@tu-plovdiv.bg
Assist. Prof. Eng. Rossen Bojilov, PhD (FEA), tel.: 032/659 766, e-mail: rossen_chi@abv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Elective subject from the curriculum for training of students to obtain Bachelor's degree, specialty "Electronics", Professional orientation 5.2 Electro technique, electronics and automation, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The discipline “Electronic technological devices " enables students to master the basic principles of operation and structures of control circuits, automatic regulation and protection of power electronic converters applicable in electronic technological devices. Students gain basic knowledge of the physical processes in electronic technology.

DESCRIPTION OF THE COURSE: Main themes: Methods for controlling step motors; DC motor control systems; Incremental speed and position measurement schemes; Control signals and drivers for control of MOSFET and IGBT transistors; Loss of power and energy in MOS controlled switch elements; Current measurement with MOS field transistor with built-in sensor and magnetostrictive matrix; Application of insulating phototransformers; Application of fiber optic interfaces in power electronic devices; Induction heating theory; Dielectric heating devices; The technique of intensive ultrasonic oscillations.

PREREQUISITES: The course of lectures and exercises is based on the knowledge of Power Electronics, Analog Circuit Engineering, Introduction to Control Theory, Impulse and Digital Circuit Engineering, Sensor Technology.

TEACHING METHODS: The lectures are presented with the help of a multimedia projector and by writing the board, considering the structure of the lecture, definitions and basic theoretical concepts, quantities, drawings, dependencies, graphs and formulas. Students are provided with the content of the lectures delivered in electronic format.

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

INSTRUCTION LANGUAGE: Bulgarian/English

BIBLIOGRAPHY:
1. Zagaevsky T., Industrial Electronics, Moscow, Energy, 1976.; 2. Skvarenina T., Power Electronics, Purdue University West Lafayette, Indiana, © 2002 by CRC Press LLC.; 3. Krishnan R., Electric motor drivers, (Modeling, analysis, and Control), Prentice Hall, Inc. New Jersey 07458, 2001.; 4. Todorov D., Converters in Appliance Engineering, Sofia, Technology, 1992.; 5. Kazmerkovsky V., Control systems for industrial electronics, Energoatomizdat, M., 1984

DESCRIPTION OF THE COURSE

Name of the course **Electronic devices for measuring non-electrical quantities**	Code: **BpE25.2**	Semester: 8
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 20 hours	Number of credits: **5**

LECTURER:

Assoc. Prof. Ph.D.. Svetoslav Ivanov (FEA), tel.: 032 659720, email: bluflam@tu-plovdiv.bg

Technical University of Sofia, branch Plovdiv.

COURSE STATUS INTHE CURRICULUM: Elective course 4 from list 4 of the Bachelor program for specialty "Electronics".

AIMS AND OBJECTIVES OF THE COURSE: With the lecture course, students learn about the principle of operation of sensor devices for measuring the basic physical quantities in industry, and with the known circuit solutions of the electronic transducers for signal processing from the sensors output. At the end of the course the students will be able to design sensor devices for application in management systems.

DESCRIPTION OF THE COURSE: The discipline is fundamental for the students' knowledge and skills in the field of modern sensing elements, which are applied in the electronic technological devices and various industrial fields. They become acquainted with modern circuit solutions and methods for processing signals from sensor outputs. In the lecture course are included basic primary transducers for measuring the basic physical quantities in the industry - temperature, humidity, pressure forces, fluid flow, mechanical displacements, intensity of light, etc. Students will be prepared to design the electronic circuits needed to amplify and convert signals from the sensors output.

PREREQUISITES: The discipline is based on the knowledge gained in: Physics; Electronic and semiconductor elements; Analog Circuits; Digital Circuits and Signals and Systems.

TEACHING METHODS: Lectures using a multimedia projector, laboratory exercises with protocols.

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

INSTRUCTION LANGUAGE; Bulgarian.

BIBLIOGRAPHY:

1. Ivanov S., Electronic devices for measuring non-electric quantities, Technical University of Sofia,2017; 2. Velchev N.. Metrology and Sensor, University Publishing House, Plovdiv, 1999; 3. System Applications Guide, Analog Devices, Inc., 1993, Section 14.; 4 Ramon Pallas-Areny and John G. Webster, Sensors and Signal Conditioning, John Wiley, New York, 1991.