DESCRIPTION OF THE COURSE

Name of the course: **Artificial intelligence and neural networks**	Code: **MpES01**	Semester: **1**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 30 hours	Number of credits: **4**

LECTURER(S):

Assoc. Prof. Ph.D. Nikola Shakev (FEA) – tel.: +359 32 659 528, email: shakev@tu-plovdiv.bg

Assoc. Prof. Ph.D. Sevil Ahmed (FEA) – tel.: +359 32 659 585email: sevil.ahmed@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum obtain Master's degree, specialty "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: Upon completion of the course, students should be able to apply the methods of artificial intelligence and in particular artificial neural networks for information and signals processing, decision making, design of systems based on training and self-learning.

DESCRIPTION OF THE COURSE: he course is built on the basis of modern concepts of the application of artificial intelligence approaches in information processing and decision-making. A set of algorithmic solutions and methods that have key characteristics for the artificial intelligence are considered, namely: training and self-learning, adaptation, etc. The discipline presents artificial neural networks in detail. Students are introduced to different structures and architectures of neural networks. Algorithms for training and adjusting the weights of artificial neural networks are considered. A number of applications are considered, mainly in the field of technology, signal processing, classification, etc.

PREREQUISITES: Mathematics, Programming.

TEACHING METHODS: Lectures with multimedia presentation. Laboratory exercises are conducted using personal computers.

METHOD OF ASSESSMENT: Two one-hour assessments at mid and end of semester.

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 **Computer networks and communications**	Code: **MpES02**	Semester: 1
Type of teaching: Lectures (L), Laboratory work (LW), Course work (CW)	Hours per semester: L – 30 hours; LW – 30 hour	Number of credits: **4**

LECTURER:

Prof. Grisha Spasov PhD (FEA), tel.: 659 724, email: gvs@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum for training of students to obtain Master's degree, specialty „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: At the end of the course the students are expected to have knowledge for Open Systems' Architecture – ISO OSI model, Global network – Internet and TCP/IP client-server applications.

DESCRIPTION OF THE COURSE: The main topics concern: 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. IEEE 802.X standard. WLAN – IEEE 802.11. Network layer. Protocols. Architecture of Internet. TCP/IP protocol stack. Internet applications. File transfer –FTP, e-mail, WWW. Network operation systems. Client-server architecture – applications. Intranet, Extranet. VLAN. Network Operating Systems. Network administration. Network management - SNMP.

PREREQUISITES: Signals and Systems, Circuit design and programming for microprocessors and microcontrollers, Fundamentals of network technologies.

TEACHING METHODS: Lectures, using slides and multimedia presentations, laboratory work, using demo-programs, protocols preparation and defence.

METHOD OF ASSESSMENT: Two one-hour assessments at mid and end of semester (60%), laboratories (20%), course work (20%).

INSTRUCTION LANGUAGE: Bulgarian.

BIBLIOGRAPHY: 1. Гриша Спасов, Николай Каканаков, Митко Шопов, “Ръководство за лабораторни упражнения по Компютърни мрежи”, ТУ София, 2011, ISBN: 978-964-438-790-7. 2. James F. Kurose, Keith W. Ross, “Computer Networking. A Top-Down Approach Featuring the Internet”, Fifth edition, Pearson, 2010, ISBN-13: 978-0- 13-607967-5. 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: **Mathematical methods for digital processing**	Code: **MpES03**	Semester: 1
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 30 hours	Number of credits: **5**
Course project (CP)-optional	Code: **MpES07**	Number of credits: **2**

LECTURER(S):

Assoc. Prof. Ph.D. Boryana Pachedjieva (FEA) – tel.: +359 32 659 708, email: pachedjieva@yahoo.com

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum obtain Master's degree, specialty "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: The aim of the course is to provide theoretical knowledge and practical skills using mathematical methods for digital processing and in particular Probabilistic and statistic methods at solving most important theoretical and practical problems in electronics – in particular statistical treatment of experimental data.

DESCRIPTION OF THE COURSE: The main topics concern: Probabilities; Random variables; System from random variables; Deterministic connections between Random variables; Statistical treatment experimental date; Random Processes; Stationary Random Processes; Markov Random Processes; Elements of the theory telegraphic systems; Transforming random processes in electronics units.

PREREQUISITES: Mathematics, Signals and systems.

TEACHING METHODS: Lectures with multimedia presentation. Laboratory exercises are conducted using personal computers.

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

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1. Фердинандов, Е., Б. Пачеджиева, Вероятностни и статистически методи в комуникациите – части 1 и 2. София, Сиела, 2005г.; 2. Венцель, Е.С., Л.А. Овчаров. Теория вероятности и ее инженерные приложения. Москва, Наука, 1988г.; 3. Гмурман, В.Е. Теория вероятностей и математическая статистика. Москва, Высшая школа, 2002г.; 4. Гмурман, В.Е. Руководство к решению задач по теории вероятностей и математической статистике. Москва, Высшая школа, 2003г.; 5. Srinath, M.D. Introduction to statistical signal processing with applications. Prentice-Hall, New Jersey, 1996г.; 6. Alberto Leon- Garcia. Probability and Random Processing for Electrical Engineering, Addison–Wesley, 1994г.

DESCRIPTION OF THE COURSE

Name of the course **Medical systems for remote monitoring, storage and data processing**	Code: **MpES04**	Semester: **1**
Type of teaching: Lectures (L), laboratory work (LW)	Hours per semester: L – 30 hours; LW – 30 hours;	Number of credits: **5**

LECTURERS:

Prof. Ph.D. Galidiya Petrova (FEA),tel.: 659 574, e-mail: gip@tu-plovdiv.bg, Prof. Ph.D Grisha Spasov (FEA), tel.: 659 724, e-mail: gvs@tu-plovdiv.bg, Technical University of Sofia, branch Plovdiv

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum for training of students to obtain Master's degree, specialty „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: After completing the course, students should acquire basic knowledge in the field of Internet-based medical systems for remote monitoring of vital physiological parameters, as well as knowledge of various distributed applications such as: Intelligent Emergency Response and Management Systems, Mobile Telemedicine Systems, Personalized Healthcare Systems.

DESCRIPTION OF THE COURSE: The main topics concern: Wireless sensors for acquiring and monitoring of physiological signals; Distributed system architectures - client / server models; Wireless computer networks; Sensor networks; Mobile tele-medicine systems employing different type wireless networks. Personalized healthcare systems.

PREREQUISITES: Good fundamental knowledge in the B.Sc. subjects Microprocessor technic and Medical electronics, and Network architectures and data security in the MSc course.

TEACHING METHODS: Lectures using multimedia presentations, laboratory exercises with demo programs.

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

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1. Petrova G., 1998, Introduction to Biological Signal Processing, Inter-University Centre for Education in Medical Radiation Physics and Engineering.; 2. A. S. Tanenbaum and M. van Steen. "Distributed Systems: Principles and Paradigms," Second Edition Prentice Hall, 2007, ISBN: 0-13-239227-5; 3. H. LABIOD, H. AFIFI, C. DE SANTIS, "Wi-Fi,BLUETOOTH, Zig Bee and WiMAX", 2007 Springer, ISBN 978-1-4020-5396-2.; 4. Guang-Zhong Yang, "Body Sensor Networks", Springer-Verlag 2006, ISBN-13: 978-1-84628-272-0; 5. Ana Fred, Joaquim Filipe, Hugo Gamboa, “Biomedical Engineering Systems and Technologies”, Springer-Verlag 2011, ISBN 978-3-642-18471-0.

DESCRIPTION OF THE COURSE

Name of the course: **Electronic energy converters**	Code: **MpES05**	Semester: **1**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 30 hours	Number of credits: **5**
Course project (CP) - optional	Code: **MpES07**	Number of credits: **2**

LECTURER:

Prof. Eng. Tsvetana Grigorova, PhD (FEA), tel.: 659711, e-mail: c_gr@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum of students to obtain Master's degree, specialty 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: The course "Electronic energy converters" aims to acquaint the students with the theoretical bases, models, methods, algorithms and applied analysis programs of the electronic power converters.

DESCRIPTION OF THE COURSE: Main topics: Main parameters of power electronic devices in terms of the power grid; Variation of the power factor in the regulation of single-phase and three-phase controlled rectifiers; Controlled rectifiers as a source of higher harmonics with respect to the power supply; Hysteresis current controlled rectifiers; Active power factor correction for uncontrollable rectifiers; Transistor active power filters; Transistor converters; Transistor converters with soft switching; Self-excited converters; Converters for electric drives; Voltage and current control; Current protections for power converters; Frequency compensation in the negative feedback loop.

PREREQUISITES: Knowledge of the following disciplines: Mathematic, Theoretical Electrical Engineering, Analogue electronics, Power supplies, Electronic converters.

TEACHING METHODS: Lectures and laboratory exercises in properly equipped laboratories; Spice-based demo-programs.

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

LANGUAGE OF INSTRUCTION: Bulgarian.

BIBLIOGRAPHY:
1.Анчев, М., Ехергийна ефективност на силови електронни устройства, С., ТУ-София, 2010; 2. Браун, М., Токозахранващи устройства, Изд. Техника, 1998; 3. Анчев, М., Силови електронни устройства, С., ТУ-София, 2019; 4. Williams, B. Power Electronics - Devices, Drivers, Applications, and Passive Components, McGraw-Hill, 2002

DESCRIPTION OF THE COURSE

Name of the course **Methods and means of designing digital integrated circuits**	Code: **MpES06**	Semester: 1
Type of teaching: Lectures (L) Laboratory work (LW)	Lessons per week: L – 30 hours. LW – 30 hours.	Number of credits: 5
Course project (CP) - optional	Code: **MpES07**	Number of credits: **2**

LECTURER:

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

COURSE STATUS INTHE CURRICULUM:

Compulsory from the curriculum for training of students to obtain Master's degree, specialty "Design and programming of electronic systems", Professional orientation 5.2 Electrical, electronics and automation, Field 5. Technical sciences.

AIMS AND OBJECTIVES OF THE COURSE: To form knowledge in the design of electronic circuits. The subject acquaints students with the automated design systems in microelectronics for design of analog, digital and digital-analog integrated circuits.

DESCRIPTION OF THE COURSE: Main themes: General characteristic of automated design systems; Organization of the database; Libraries, structure of the library; Introduction of circuit diagram - VHDL; Simulation of circuits; Conversion and optimization of VHDL description; Design of integrated circuit topology; System for design of digital integrated circuits; Introduction to the Design Environment; Design algorithm; Simulate the project and detect errors in its design; Tools for re-engineering the project; Synthesis of input HDL description in a bound technology project at the gate level; Input description of the technology library and compilation of the description in a VHDL library.

PREREQUISITES: The discipline is based on the knowledge gained in the following disciplines: semiconductor elements and digital electronics.

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

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

INSTRUCTION LANGUAGE; Bulgarian/English

BIBLIOGRAPHY:

1.) M. Hristov, Design Systems in Microelectronics, Sofia, 2004; 2.) Cr. Filipova et al., Using (v) HDL for Electronic Hardware Synthesis, Sofia, 2004; 3.) Ashenden P.J The Designer's Guide to VHDL, 2nd Edition Morgan Kaufmann Publishers 2001; 4.) Charles. H., Digital System Design Using VHDL, 1998.

DESCRIPTION OF THE COURSE

Name of the course: **Circuit design and programming for embedded systems**	Code: **MpES08**	Semester: **2**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 20 hours	Number of credits: **3**

LECTURER(S):

Assoc. Prof. Eng. Boyko Baev Petrov, PhD (E), tel.: 769, e-mail: bpetrov@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum for training of students to obtain Master's degree, specialty "Design and programming of electronic systems", Professional orientation 5.13 General Engineering, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: After completing the course, students should be able to independently perform circuit design of microprocessor systems with industrial and mobile applications compatible with operating systems for embedded applications as well as use and compile program functions and libraries for initialization, exchange, processing and output of data, states and commands to external objects and systems.

DESCRIPTION OF THE COURSE: The main topics concern: Concept and basic requirements for microprocessor system for embedded applications, architecture of universal and specialized microprocessors, features of standardized interfaces and protocols for system interconnection via LAN and memory cards, stages of design, implementation and application programming based on standardized and unified development systems and libraries; criteria for selection and comparison of representatives of different microprocessor architectures.

PREREQUISITES: Circuit design and programming for microprocessors and microcontrollers

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/English

BIBLIOGRAPHY: 1. Trevor Martin, The Designer's Guide to the Cortex-M Processor Family: A Tutorial Approach 1st Edition, Elsevier Science, 13th March 2013, 2016, ISBN-13: 978-008098296 , ISBN-10: 0080982964, ISBN 9780081006344; 2.Trevor Martin, The Designer's Guide to the Cortex-M Processor Family: A Tutorial Approach 2nd Edition, ISBN-13: 978-0081006290, ISBN-10: 0081006292; ARM User Manual http://infocenter.arm.com/help/topic/com.arm.doc.dui0068b/index.html; 3. PIC32 architecture: https://people.ece.cornell.edu/land/courses/ece4760/PIC32/Microchip_stuff/PIC32ComputerArchitecture.pdf; 4. PIC32MX Family Reference Manual, 2008 Microchip Technology Inc., DS61132B

DESCRIPTION OF THE COURSE

Name of the course: **Electronic converters for electric motors control**	Code: **MpES09.1**	Semester: **2**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 20 hours	Number of credits: **3**

LECTURERS:

Prof. Eng. Tsvetana Grigorova PhD (FEA), tel.:032659721, e-mail: c_gr@tu-plovdiv.bg

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 of students to obtain Master's degree, specialty 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: The course aims to acquaint students with the power electronic devices applicable to the DC and AC electric drives, the control circuits for the used power switches and the sensor devices useful in the feedback circuits. Students gain knowledge about the methods of speed control of DC, brushless, asynchronous and stepper motors.

DESCRIPTION OF THE COURSE: The subject is fundamental for the students' knowledge and skills in power electronic circuits and devices to control electric motors. It studies the basic methods and circuits for the construction of electric drives for control of DC, asynchronous and stepper motors. Circuits of single-phase and three-phase autonomous voltage source inverters and specialized circuits for control of DC, brushless and stepper motors are modelled and studied. In the laboratory exercises, students examine the common work of the power circuit and the electrical machine by introducing the practical solution of a real engineering project.

PREREQUISITES: The discipline is based on the knowledge gained from the subjects: Analogue electronics, Digital Electronics, Electronic converters, Circuit design and programming for microprocessors and microcontrollers, Power supplies and energy sources, Electromechanical Systems, Electronic regulators, Sensors and sensor devices.

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

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

INSTRUCTION LANGUAGE; Bulgarian.

BIBLIOGRAPHY: 1. Р. Личев, Проектиране на полупроводникови електрозадвижвания, ТУ-София, 2005, 2. B. K. Bose, Power Electronics and Motor Drives: Advances and Trends, 2006, Elsevier Inc. 3. R. Krishnan, Electric Motor Drives. Modelling, Analysis, and Control, Singapore, 2003, ISBN 81-297-0319-1, 4. Muhammad Rashid, Power Electronics Handbook, Copyright, 2007, Elsevier Inc..

DESCRIPTION OF THE COURSE

Name of the course: **Applied electronic circuits and devices**	Code: **MpES09.2**	Semester: **2**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 20 hours	Number of credits: **3**

LECTURER(S):

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

COURSE STATUS IN THE CURRICULUM: Elective course for full-time students majoring in "Design and programming of electronic systems" for the "Master's Degree". Professional orientation 5.2 "Electrical, Electronics and Automation", Field 5 „Technical Sciences".

AIMS AND OBJECTIVES OF THE COURSE: To deepen students' knowledge in the field of applied electronics. Expand their skills for design and development of electronic measuring and control devices, power supplies satisfying the requirements of international safety and electromagnetic compatibility standards.

DESCRIPTION OF THE COURSE: Schematic solutions for measuring and control of technological processes in the industry, home security systems, the requirements of international safety standards and electromagnetic compatibility of power supply devices are discussed. Students are acquainted with the main stages of design and manufacture of electronic appliances and application of software products - Micro-Cap, PSPICE, KICAD for analysis of modeling and design of electronic systems.

PREREQUISITES: Knowledge of the following courses: Theoretical Electrical Engineering, Electrical Measurements, Semiconductor Elements, Analog Circuitry, Power supplies, Theory of Electronic Circuits.

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. Соклоф С., "Приложения на аналогови интегрални схеми", София, Техника, 1990. 2. Уильямс Б., "Силовая электроника, приборы, управление, применение", Москва, Энергоатомиздат, 1993. 3. Linear Applications Handbook. TL/3187, National Semiconduktor, 1991. 4. Best, Roland E., "Phase-Locked Loop - design, simulation and application", 5th ed. McGraw Hill 2003, ISBN 0-07-141201-8. 5. Robert W. Ericson, Dragan Maksimovic, "Fundamentals of Power Electronics", second ed., Kluwer Academic Publishers 2004, eBook ISBN 0-306-48048-4, Print ISBN 0-7923-7270-0 6. Christophe P. Basso, "Switch-Mode Power Supply Spice CookBook", McGraw Hill, ISBN 0-07-137509-0.

DESCRIPTION OF THE COURSE

Name of the course: **System approach in embedded programming**	Code: **MpES10.1**	Semester:**2**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 20 hours	Number of credits: **3**

LECTURER(S):

Assoc. Prof. Eng. Nikolay Kakanakov, Ph.D, tel.: 032-659-765, e-mail: kakanak@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 Design and programming of electronic systems, Professional orientation 5.13 General Engineering, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: At the end of the course the students should be able to independently select, activate and use operating systems for embedded applications, to compile, update and use program functions and libraries designed and standardized for embedded operating systems applications.

DESCRIPTION OF THE COURSE: The main topics concern: Concept and structure of an operating system for embedded applications, multi-task and multi-user mode of operation, rules and means for describing and setting up an application for an embedded operating system; stages of activating and configuring an embedded operating system, compiling functions and libraries for running an operating system for embedded applications, structure and features of working with FreeRTOS and Linux.

PREREQUISITES: Circuit and programming for embedded systems

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/English

BIBLIOGRAPHY:
1. https://www.freertos.org/a00104.html,

2. https://docs.aws.amazon.com/freertos/ 3. https://www.freertos.org/tutorial/index.html

4. https://www.microsemi.com/product-directory/intellectual-property-partners/5139-freertos

6. Richard Barry, Mastering the FreeRTOS Real Time Kernel A Hands-On Tutorial Guide, Real Time Engineers Ltd. 2016.7. http://www.ee.surrey.ac.uk/Teaching/Unix/,

8. Linux for Beginners: The Complete Tutorial Guide for Beginners and Pro to Master the Linux Operating System and Command Line Basics (Large Print Edition) Paperback – Large Print, April 22, 2021 , ISBN-13: 979-8742720881 9. How Linux Works, 2nd Edition: What Every Superuser Should Know Second Edition ISBN-13: 978-1593275679

COURSE DESCRIPTION

Name of the course **Programmable Logic Controllers**	Code: **MpES10.2**	Semester: **2**
Type of teaching: Lections (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 20 hours	Credits: **3**

LECTURERS:

Assoc. prof. Albena Taneva, Ph.D., phone: 659 585, e-mail: altaneva@tu-plovdiv.bg
Technical University - Sofia

COURSE STATUS IN THE CURRICULUM: Elective subject from the curriculum obtain Master's degree, specialty "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: After studying this course the students should be able to understand the principles of operation, to design and write programs for industrial control systems using Programmable Logic Controllers connected to laboratory sets up.

DESCRIPTION OF THE COURSE: The main topics concern: Discrete (relay) control. Axioms and laws of Boole's algebra used in the Logical 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: Programming, Electronics.

TEACHING METHODS: Lectures, using slides, laboratory and course work (optional), work in teams, protocols and course work description preparation and defence. Guided practical work using controllers manufactured by SIEMENS, OMRON, Schneider and Panasonic.

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

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 **Telecommunications**	Code: **MpES11.1**	Semester: 2
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 20 hours	Number of credits: **3**

LECTURER:
Assist. Prof. Iliya E. Petrov, Ph.D., Department of Electronics,
e-mail: iedu@abv.bg, Technical University-Sofia

COURSE STATUS IN THE CURRICULUM: Elective subject from the curriculum obtain Master's degree, specialty "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:. The aim of the course is the student to learn the basic architecture of fixed, mobile and IP telecommunication systems, transmission media, transmission transport and service

DESCRIPTION OF THE COURSE: The main topics concern: Structure and organization of telecommunication systems; tele services and quality factors; standards (recommendations) and organizations in telecommunications; basic reference models; switching modes; analogue and digital multiplexing; channel switching; transmission media; coding types in telecommunications; digital hierarchy; access methods to the telecommunication network; structure of mobile networks; organization of satellite communications

PREREQUISITES:. Good knowledge of Signals and Systems and Communication Equipment.

TEACHING METHODS: Lectures with multimedia projector for the structure of the lecture, some definitions and essential knowledge, magnitudes, schematics, equations, graphics and formulae. On labs is used principally MATLAB.

METHOD OF ASSESSMENT: Two one-hour assessments at mid and end of semester (70%), laboratories (30%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1:1. Цанков Б., Телекомуникации фиксирани, мобилни и IP, Нови знания, София, 2006.2. Пулков Вл., Мултиплексни системи в телекомуникациите, Нови знания, София, 2007.3. Мерджанов П., Телекомуникационни мрежи, Нови знания, София, 2002.4. Мирчев С., Телеграфично проектиране, Нови знания, София, 2002.5. Пенчева Е, Мобилни мрежи, Нови знания, София, Нови знания 2002. 6. Freeman R., Fundamentals of Telecommunications, John Wiley & Sons Inc., New Jersey, 2005. 7. Уиндър С., Телекомуникации. Принципи, Технологии, Стандарти, Техника, София, 1999. 8. Пулков Вл., П. Колева, Основи на предаване на информацията, Нови знания, София,2009.

DESCRIPTION OF THE COURSE

Name of the course **Optical communication systems**	Code: **MpES11.2**	Semester: 2
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 20 hours	Number of credits: **3**

LECTURER:
Assoc. Prof. PhD B. K. Pachedjieva (FEA) – tel.: 659 708
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Elective subject from the curriculum obtain Master's degree, specialty "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: 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:. Good fundamental knowledge in the courses: Higher mathematics, Theoretical electrical engineering, Signals and systems.

TEACHING METHODS: Lectures, and laboratory work.

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

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1: 1. Фердинандов, Е., **Б. Пачеджиева**, К. Димитров. Оптични комуникационни системи. Техника, София, 2007, ISBN 9789540306780; 2. Фердинандов, Е., **Б. Пачеджиева**, К. Димитров. Оптични комуникационни системи – аналитични описания, алгоритми за инженерен синтез, примерни проектирания. ТУ–София, филиал Пловдив, 2007, ISBN 9789548779890; 3. Фердинандов, Е., Б. Пачеджиева, Вероятностни и статистически методи в комуникациите, Сиела, София, 2005; 4. Фердинандов, Е., Лазерното лъчение в радиотехниката, София, Техника, 1981; 5. Фердинандов, Е, Основи на оптоелектрониката – част I, София, Техника,

DESCRIPTION OF THE COURSE

Name of the course: **Project Management**	Code: **MpES12.1**	Semester: 2
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 20 hours	Number of credits: **3**

LECTURER(S):

Professor Toni Mihova, PhD, (FMU), tel.0893 69 06 55; email: expert2009@abv.bg;

Assist. Prof.Georgi Georgiev, PhD, (FMU), tel. 0888 22 72 82, email: ekip_pd@abv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Elective subject from the curriculum obtain Master's degree, specialty "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: 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 within the area of motor transport business.

DESCRIPTION OF THE COURSE: The course is focused on identifying project ideas and turning them into project proposals. The 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; Project teambuilding; Main elements of the project cycle and the project proposal; Developing project activities and identifying necessary resources; Project budgeting; Project implementation and management; National and EU programmes supporting Bulgarian Motor Transport business within the period 2014-2020.

PREREQUISITES: none.

TEACHING METHODS: Lectures with multimedia presentation.

METHOD OF ASSESSMENT: Ongoing assessment..

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1. Сборник материали на Програма „Партньори за проекти"на Център по предприемачество към Технически университет – София, филиал Пловдив, 2005; 2.Наръчник „Управление на цикъла на проекта", София 2005 ;3. Апостолов,А., „Основи на проекта", Projecta , София, 2004; 4. Матеева, М., „Разработване и управление на проекти по програми на Европейския съюз",Евроконсулт 06, 2007; 5. Kemp, Sid "Project management- made easy" 2006.

DESCRIPTION OF THE COURSE

Name of the course: **Industrial legislation**	Code: **MpES12.2**	Semester: 2
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 20 hours	Number of credits: **3**

LECTURER(S):

Assoc. Prof. Jur. engineer Ivan Nikolov Shopov, PhD, tel. 0885537762, e-mail:

ivan_chopov@abv.bg,

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Elective subject from the curriculum obtain Master's degree, specialty "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: pon completion of the course, students must acquire basic legal knowledge and skills to enable them to successfully choose strategies for behavior in resolving various cases that arise in practice.

DESCRIPTION OF THE COURSE: Industrial law is one of the main courses that shapes the general theoretical preparation of students. It includes topics on: theory of law, legal norms, sources of law, legal acts, subject, system and sources of civil law, representation, property regulation, administrative law, industrial property, competition law, unfair competition, legal protection regime of environmental law, bond law..

PREREQUISITES: Basic knowledge of general theory of law is required and is taught by the teacher during the lectures.

TEACHING METHODS: The lectures use multimedia presentations, a projector, a marker and a whiteboard. Students have access to the presentations in advance and can supplement them with the teacher's explanations. In the seminars, students solve cases or prepare papers for discussion with the teacher and other group members.

METHOD OF ASSESSMENT: Ongoing assessment..

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. C(1) **Prof. Dr. Emil Zlatarev and staff**. Fundamentals of Law - Part I and Part II, Ciela Publishing House, latest edition; (2) **Dimitar Radev**. General Theory of Law, ed. LIK, Sofia 1997; (3) **Sources of Law**: Constitution of the Republic of Bulgaria, Commercial Law, Law on Obligations and Contracts, Law on Protection of Competition, Law on Marks and Geographical Indications, Patents Act, Copyright and Related Rights Act.

DESCRIPTION OF THE COURSE

Name of the course: **Power Supplies**	Code: **FaMpES01**	Semester: 2
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 30 hours	Number of credits: 4

LECTURER(S):

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: Facultative subject from the curriculum obtain Master's degree, specialty "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: The course "Power supplies" aims to teach students the principles of operation and methods for designing basic circuits of electronic power supplies and power sources. Students gain practical experience in studying rectifiers, continuous voltage and current regulators, switch mode converters, batteries, and other power sources.

DESCRIPTION OF THE COURSE: Parameters and characteristics of basic circuits of power supplies and converters of electrical energy are considered - rectifiers, DC voltage and current regulators with continuous operation, switch mode converters, batteries and other energy sources. Students are also introduced to operating principles and features of uninterruptible power supply systems. The course focuses on acquiring knowledge related to analysis and design methods through simulation programs and models - PSpice for TI and PLECS. A course project is also included to design a power supply device for a specific assignment.

PREREQUISITES Required knowledge in disciplines: Electrical engineering, Semiconductor devices, Electronic circuits theory, Analogue electronics, Digital electronics.

TEACHING METHODS: Lectures using slides, lab exercises with protocols and simulation software tools: PSpice for TI, PLECS with description and defense.

METHOD OF ASSESSMENT: The course grade is formed by considering the grade of the written exam (80%) and the defense of the laboratory exercise protocols (20%). The examination consists of written answers to 3 to 5 set problems, case studies, or assignments that productively test the student's knowledge and skills. The course project is an independent assessment.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1. Стефанов Н., "Токозахранващи устройства", Техника, С., 2010.; 2.Арнаудов Д., Ст. Денчев, Г. Гигов, "Ръководство за лабораторни упражнения по ТЗУ" ТУ-София, 2014.; 3. Стефанов Н., Д. Дечев, "Ръководство за лабораторни упражнения по ТЗУ", Печатна база ТУ-София, 1994.; 4. Стефанов Н., "Ръководство за проектиране на ТЗУ", Печатна база ТУ-София, 1994.; 5. Браун М., "Наръчник по токозахранващи устройства", Техника, С., 1998.; 6.Анчев М., М. Минчев "Системи за непрекъсваемо електрическо захранване" С., Авангард, 2006.; 7. Юдов, Д., В. Вълчев, "Токозахранващи устройства", Варна, ТУ Варна и БСУ, 2008. ISBN 978- 954-9370-57-7; 8. www.onsemi.com "Switch Mode Power Supply" — Reference manual 2002.; 9. www.onsemi.com "Power Factor Corection" — Handbook 2004

DESCRIPTION OF THE COURSE

Name of the course: **Intelligent sensor-actuator systems**	Code: **FaMpES02**	Semester: **2**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 30 hours	Number of credits: **4**

LECTURER(S):

Assist. Prof. Ivan Maradzhiev, Ph.D, tel.: 032 659 776, e-mail iv_mar@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Facultative subject from the curriculum obtain Master's degree, specialty "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: The aim of the course is to provide electronics engineering students with detailed knowledge about the types of sensors and actuators in the industry and the 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: Needed is basic knowledge obtained from the courses in "Analog electronics", "Electromechanical systems", as well as knowledge in physics and chemistry.

TEACHING METHODS: Lectures supported by slides and PowerPoint applications. Labs are done with real sensor and actuators systems. Students work out individual term tasks

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

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:

1. Clarence W. de Silva. Sensors and Actuators: Control System Instrumentation, 2007. 2. Stephen E. Derenzo. Practical Interfacing in the Laboratory Using a PC for Instrumentation, Data Analysis and Control. University of California, Berkeley, 2003. 3. Manfred Kaltenbacher. Numerical Simulation of Mechatronic Sensors and Actuators, ISBN 9783642090516 Springer-Verlag Berlin and Heidelberg GmbH & Co. K, 2010.