DESCRIPTION OF THE COURSE

Name of the course: **Modeling and simulation of mechatronic systems**	Code: **BpMEH15**	Semester: 7
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 45 hours LW – 30 hours	Number of credits: 6

LECTURER(S):

Assoc. Prof. Angel Lenegerov, PhD (FME), tel: 032 659 613 e-mail: anlen@tu-plovdiv.bg
Technical University of Sofia, branch Plovdiv

COURSE STATUS IN THE CURRICULUM: Compulsory course from the curriculum for training students for bachelor's degree, specialty "Mechatronics", professional field 5.1 Mechanical Engineering, field 5. Technical sciences.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the training in "Modeling and simulation of mechatronic systems" is to acquaint students with the nature, basic concepts, methodology, technology and methods for modeling and simulation of various mechatronic systems.

DESCRIPTION OF THE COURSE: The methods for formalization of the information necessary for modeling and simulation are considered. Serious attention is paid to the methods of parametric and structural optimization. The necessary attention is paid to the types of models and the ways of their compilation. The procedures for searching for rational and optimal solutions are also considered. Special attention is paid to the modern tools applicable in stimulation modeling. The methods for engineering static and dynamic analysis, as well as the software products used for this purpose are also considered. Specific examples for modeling and simulation of mechatronic systems with the respective software systems that perform these processes are also considered.

PREREQUISITES: Basic knowledge of modeling and simulation is required to effectively design and implement various mechatronic systems.

TEACHING METHODS: The lectures are conducted with the help of a projector, through which diagrams, tables, graphs and illustrative materials are designed. The laboratory exercises are conducted in a computer class and are training to work with specific design systems.

METHOD OF ASSESSMENT: Exam

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1. Ташев, М.Д. Инженерен анализ с CAE системи, Пловдив, 2015; 2. Solidworks Simulation tutorials; 3. Ташев, М.Д. COSMOSWorks – обучение с примери. Ч. 1 ТУ-София, Филиал Пловдив, 2006; 4. Ташев, М.Д., Ст. Николов COSMOSWorks – обучение с примери. Ч. 2 ТУ-София, Филиал Пловдив, 2006; 5. Solidworks Simulation Online User's Guide; 6. Янакиев И., Ст. Николов, CAD/CAM/CAE системи в мапиностроенето, София, 2010; 7. Тенчев Р.Т. Метод на крайните елементи (Ръководство за работа с COSMOS/M) ТУ-София 1998г.; 8. Чакърски Д., Т. Вакарелска. Инженерни изследвания и симулационно моделиране. Учебник. ИК на ТУ – София, 2008; 9. Тодоров Н., Д.Чакърски. Автоматизация на проектирането в машиностроенето. С., Техника, 1994; 10. Чакърски Д., В. Георгиева, И. Янакиев. Ръководство за лабораторни упражнения по автоматизация на проектирането.; ИК на ТУ – София, 2005; 11. Чакърски и к-в. Промишлени роботи, роботизирани технологични модули и системи. Част 2. ИК на ТУ – София, 2003.

DESCRIPTION OF THE COURSE

Name of the course: **Electronic regulating and control devices and systems**	Code: **BpMEH16**	Semester: **7**
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. Misho Matsankov, PhD (FEA), e-mail: mishel@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum for training of students to obtain Bachelor's degree, specialty " Mechatronics ", Professional orientation 5.1 Mechanical Engineering, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: Students should be able to apply the laws of regulation in the design of electronic regulators that are used in industry, communications, energy, transport and other areas, as well as to choose the appropriate regulation law according to the assigned transition processes of the closed regulation system..

DESCRIPTION OF THE COURSE: Main themes: Identification of the objects of regulation; Position regulators; Proportional and proportionally-integrated law for regulation; Proportional Integral-Differential law for regulation; Methods for regulating the speed of a DC motor; Frequency speed regulation of an asynchronous motor; Digital thermometer and thermostat; Digital control systems; Tracking and memorizing systems; Numerical design with approximation; Choice of regulation law; Adjusting the controller parameters according to the requirements for the transition process. Programmable logic controllers and basic programming languages.

PREREQUISITES: Analog Circuit Engineering, Digital Circuits, Sensor Systems and Microprocessor Engineering.

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 the semester (80%), laboratories (20%)

INSTRUCTION LANGUAGE: Bulgarian/English

BIBLIOGRAPHY: 1. Ivanov S., Electronic regulators, Technical University of Sofia, 2008; 2. Kaloyanov G., Automation of production and control, S.,T.,1992; 3. Ivanov I., Relay electronic regulators,S.,T.,1978; 4. Naplatanov K., Hinov H., Automation of technological processes, S.,T.,1987; 5. Klashe G. Hofer R., Industrial electronic circuits, S.,T.,1984; 6. Ivanov S., Vasileva S., Laboratory exercises manual on Electronic Regulators, Plovdiv, 2001. 7. Dave Polka, Motors and Drives, A Practical Technology Guide Copyright © 2003 ISA – The Instrumentation, Systems, and Automation Society, All rights reserved, Printed in the United States of America, ISBN 1-55617-800-X.

DESCRIPTION OF THE COURSE

Name of the course: **Precision mechanical systems in mechatronics**	Code: **BpMEH17**	Semester: 7
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 45 hours LW – 30 hours	Number of credits: **6**
Course project (CP)	Code: **BpMEH20**	Number of credits: **3**

LECTURER(S):

Assoc. Prof. Angel Lenegerov, PhD (FME), tel: 032 659 613 e-mail: anlen@tu-plovdiv.bg

Technical University-Sofia, Plovdiv Branch

COURSE STATUS IN THE CURRICULUM: Compulsory course of the curriculum for Bachelor's degree, specialty "Mechatronics", professional field 5.1 Mechanical Engineering, field 5. Technical sciences.

AIMS AND OBJECTIVES OF THE COURSE: The aim is for students to get acquainted with the basics of precision mechanical devices (apparatus) and mechanisms, whose geometric accuracy directly determines the quality of the product, the quality of functioning and the quality of the result of their work.

DESCRIPTION OF THE COURSE: The following are considered: the philosophy of building precise mechanical systems and in particular those used in mechatronics; the sources of errors in their operation and the ways of their calculation and reduction; standard components of precision equipment with features, characteristics and recommendations for use or construction. Main topics: Accuracy of mechanisms, Characteristics of accuracy of mechanisms, Sources of positioning errors, Error analysis, Thermal errors, Structural elements of precision mechanisms - structures, linear bearings, converting mechanisms, elastic guides and hinges, kinematic joints sensors.

PREREQUISITES: The basic knowledge acquired from the training in the courses "Mechanics", "TMM", "Machine Elements", "Optical Engineering", "Fundamentals of the design of mechatronic systems" is required.

TEACHING METHODS: The lectures are delivered with the help of video presentations. During the laboratory exercises practical computational problems are solved.

METHOD OF ASSESSMENT: Писмен изпит с тест, вземат се предвид и резултатите от упражненията.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Slohum, Alexander H., Precision Machine Design, Prentice-Hall,New Jersey, ISBN 0-13-690918-3, 1992. 2. Leach, R. K., editor. , Smith, S. T., editor., Basics of Precision Engineering, CRC Press - Taylor & Francis Group, ISBN 9781498760850, 2018. 3. Hermans Soemers, Design Principles for precision mechanisms, T-Pointprint, Enschede, ISBN 978-90-365-3103-0, 2010 4. Samir Mekid, Introduction to Precision Machine Design and Error Assessment, CRC Press - Taylor & Francis Group, ISBN 13: 978-0-8493-7887-4, 2009. 5. Layton Carter Hale, Principles and Techniques for Designing Precision Machines, University of California - Livermore, California - 94551, 1999. 6. Латыев С. М., Конструирование точных (оптических) приборов, Издательство «Лань», ISBN 978-5-8114-1734-6, 2015. 7. Курс: Прецизни механични системи в мехатрониката (tu-plovdiv.bg).

DESCRIPTION OF THE COURSE

Name of the course: **Robotic technologies**	Code: **BpMEH18**	Semester: **8**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 15 hours	Number of credits: **5**

LECTURER(S):

Assoc. Prof. Angel Lengerov, PhD (MIE), E-mail: anlen@tu-plovdiv.bg,
Senior Assist. Eng. Penko Mitev, PhD (MIE), E-mail: penkomitev@tu-plovdiv.bg,
Technical University of Sofia, Plovdiv Branch

COURSE STATUS IN THE CURRICULUM: Compulsory course from the curriculum for training students for bachelor's degree, specialty "Mechatronics", professional field 5.1 Mechanical Engineering, field 5. Technical sciences.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is for students to gain knowledge about methods and tools for design and application of modern robotic technological methods.

DESCRIPTION OF THE COURSE: The course deals with the problems in the design, implementation and operation of modern robotic technological complexes. The main tasks related to the automatic assembly of the details are considered, as well as the methods and technical means for automation of the assembly processes. There is a place for technological methods for robotic welding and the design of robotic welding complexes. Typical assembly solutions of such complexes for assembly, welding and other characteristic discrete processes and operations are considered. Appropriate attention is paid to the programming, operation and safe operation in the conditions of the robotic complexes. Modern methods for evaluation and selection of an investment option for a robotic technological system are presented.

PREREQUISITES: Basic knowledge acquired from the training in the disciplines: "Industrial Robots", "Production Automation", as well as knowledge of "Mathematics", "Mechanics", "Machine Elements", "TMM", "Electrical Engineering and Electronics" and programming.

TEACHING METHODS: Lectures using slides and company catalogs in laboratory exercises and developed methodological materials.

METHOD OF ASSESSMENT: The grade is formed on the basis of an exam grade (80%) and a laboratory exercise grade (20%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1.”Автоматизация на дискретното производство”,ТУ, 2008 год.; 2 Митев В., Г. Хаджикосев, „Системи от машини с ЦПУ”, С., Техника, 1984 3. Гановски В., и др., Основи на автоматизацията, роботизацията и ГАПС, С., 1997; 4.Хаджикосев Г., „Ръководство за лабораторни упражнения по автоматизация на ГДП” ТУ,С., 1995; 5.Гъвкаво автоматично производство, Техника, превод от руски, 1987 год.; 6. Малаков, И. Нискостойностна автоматизация на дискретното производство. ISBN 978-954-438-799-0, Издателство на ТУ – София, София, 2009.

DESCRIPTION OF THE COURSE

Name of the course: **Microprocessor systems**	Code: **BpMEH19**	Semester: **7**
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S)	Hours per semester: L – 45 hours S – 15 hours LW – 0 hours	Number of credits: **5**

LECTURER(S):
Assoc. Prof. Sevil Ahmed, PhD, (FEA), Phone: 032 659 585,
e-mail: sevil.ahmed@tu-plovdiv.bg, Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory for training of students to obtain Bachelor's degree, specialty Mechatronics, Professional orientation 5.1 Mechanical Engineering, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: At the end of the course the students are expected to have basic knowledge in the field of microprocessor systems (MPS) used in mechatronics, including: system architecture, principles of operation, microprocessor program model, system instructions, methods of addressing, configuration of input/output, as well as practical skills in developing programs for microprocessor systems in the context of embedded systems for control and data acquisition (mainly in C language).

DESCRIPTION OF THE COURSE: This course introduces basic knowledge on computer architectures oriented mainly to architecture of control systems. The main topics concern: Architecture of microcomputer systems; Organization and architecture of microprocessors; Physical and logical memory organization; Input/Output system – standard and process peripheral devices, organization; Advanced architectures. The main goal of the course is design aspects of microcomputer systems oriented to control applications. Design and exploitation of applications oriented to different domains is discussed too. Hardware influences on system and application software is special issue of the course.

PREREQUISITES: Mathematics I, Mathematics II, Mathematics III, Analog and Digital Circuits

TEACHING METHODS: Lectures, visually illustrated; seminars and course works.

METHOD OF ASSESSMENT: Written final examination (80%); course work (20%).

INSTRUCTION LANGUAGE: Bulgarian.

BIBLIOGRAPHY:
1. Иванов И. Е. и О. Маринов, Микропроцесорна техника, ч. I, ТУ София, 2007; 2. Yiu, Joseph, The Definitive Guide to the ARM Cortex-M3, Newnes, USA, 2007; 3. Г. Спасов, М. Шопов, В. Спасова, Н. Каканаков "Ръководство за лабораторни упражнения по Микропроцесорни системи", ТУ София, 2013, ISBN: 978-619-167-021-5; 4. J. Ganssle, Embedded Systems. World Class Designs, Newnes Press, 2007, ISBN-13: 978-0750686259.

DESCRIPTION OF THE COURSE

Name of the course: **Control and quality management**	Code: **BpMEH21**	Semester: 8
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 15 hours	Number of credits: 4

LECTURER(S):

Assoc. prof. Pavlinka Katsarova Ph.D , department (MIE), e-mail: p_katsarova@abv.bg,
Senior Assist. Eng. K. Georgiev PhD, department (MIE), e-mail: k.georgiev@tu-plovdiv.bg,
Technical University-Sofia, branch Plovdiv

COURSE STATUS IN THE CURRICULUM: Compulsory course from the curriculum for training students for Bachelor's degree, specialty "Mechanical Engineering and Instrumentation", professional field 5.1 Mechanical Engineering, field 5. Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the training is for students to acquire theoretical and applied knowledge in the field of quality control and management. Students gain knowledge about the methods of control in mechanical engineering practice, engineering methods for quality diagnostics and processing of the results of measurements. Skills for solving applied tasks related to the control, certification and audit of quality management systems.

DESCRIPTION OF THE COURSE: The main methods for quality control are considered. The technical and economic indicators for evaluation of machine-building production. Engineering methods for quality assessment and diagnosis. Improving and ensuring quality Costs for quality. Quality management systems and preparation for certification of companies. Different types of audit of quality systems. In the laboratory exercises practical skills for solving various engineering tasks are acquired. Statistical data processing. Methods for correlation and regression analysis of obtained results.

PREREQUISITES: Knowledge of "Mathematics" "MIT", "Physics", "Electrical Engineering", "Machine Elements", "Technology of Mechanical Engineering" and others is required.

TEACHING METHODS: Lectures delivered with the help of presentation of multimedia equipment, slides and videos. Laboratory exercises are performance of independent tasks, independent solving of applied course tasks.

METHOD OF ASSESSMENT: Exam or current control. Test test which forms 80% of the total grade, laboratory exercises - 20% and 10% of the course assignment.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Записки от лек.курс на водещият преподавател – доц. д-р П. Кацарова, 2. Дюкенджиев Г.,Р. Йорданов,Контрол и управление на качеството, Софтрейд, 3.Хаджийски П.,Технологични основи на управление на качеството на машиностроителните изделия,Ту—София, 4.Тодоров Д.,Мениджмънт на качеството, Аскони - София.

DESCRIPTION OF THE COURSE

Name of the course: **Economy and management**	Code: **BpMEH22**	Semester: **8**
Type of teaching: Lectures(L) Laboratory work (LW)/Seminars (S) Course work (CW)	Hours per semester: L – 30hours S – 0 hours LW – 0 hours	Number of credits: **3**

LECTURER(S):

Assoc. Prof. Toni Mihova, PhD (FME), tel.: 0893 69 06 55, e-mail:mihova@tu-plovdiv.bg
Assist,prof. Desislava Shatarova PhD (FME), tel.: 0886 89 52 02;
email:desislava_shatarova@abv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: The course"Economy and management"is included as mandatory for Bachelor degree students in Mechatronics.

AIMS AND OBJECTIVES OF THE COURSE: Learning fundamentals and modern condition of dynamic economic and management processes in mechatronics enterprise in way students to be able to analyse ongoing economic and management processes in mechatronics enterprises as system.

DESCRIPTION OF THE COURSE: TheMain topics:Main functions in aircraft enterprise management: planning, organizing and control. Communication in aircraft enterprise management. Style of management, management decisions, management of conflicts.

PREREQUISITES: Fundamentals of economy of enterprise, industrial management and Humanites...

TEACHING METHODS: Lectures with presentations, discussions with active participation of students after preparation...

METHOD OF ASSESSMENT: Final assessment, resulting in a mark, consisting of two components: exam's test with a weight of 0,70 and lecture presentation`s grade assessment workwith a factor of 0,30..

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:1. 1.Donchev, D.,and others,Economy of enterprise,Sofia,2020.2.Deneva, A., Gutsev, G., IndustrialeconomyAvangardprint, 2008,3.Popov, ., Marinova, U.,Economy and organization of company,Gorexpress,20064.Mihova, T., Economy of enterprise,Macros,Plovdiv,2017. 5 Ivanov,Iv.,Fundamentals of management,"Macros",Plovdiv6.Angelov, A., Fundamentals of management, "Polina commerce", Sofia, 20097.Donchev, D, Managment of enterprse.Operational S.., 2015 8.Iliev, Iv., and others., Economy and management, Sofia, 2008.

DESCRIPTION OF THE COURSE

Name of the course: **Reliability and diagnostics of devices and machines**	Code: **BpMEH23**	Semester: **8**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 15 hours	Number of credits: **3**

LECTURER(S):

Assoc. Prof. Angel Lengerov, PhD (MIE), E-mail: anlen@tu-plovdiv.bg,

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory elective facultative subject from the curriculum for training of students to obtain Bachelor's degree, specialty Mechanical Engineering, Professional orientation 5.1 Mechanical Engineering, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The course acquaints students with the physical nature of the reliability of machines and the mathematical methods for its prediction.

DESCRIPTION OF THE COURSE: Main topics: Parameters of the reliability of the elements of the machines and mathematical models for its forecasting.

PREREQUISITES: Physics, mathematics, theoretical mechanics, resistance of materials.

TEACHING METHODS: Физика, математика, теоретична механика, съпротивление на материалите.

METHOD OF ASSESSMENT: Lectures and laboratory work

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: All available scientific literature sources for reliability and diagnostics of devices and machines.

DESCRIPTION OF THE COURSE

Name of the course: **Robotics Systems Modelling and Simulation**	Code: **BpMEH24.1**	Semester: **8**
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S) Course work (CW)	Hours per semester: L – 30 hours S –0 hours LW – 15 hours	Number of credits: **4**

LECTURER(S):

Assist. Prof. Eng. Vasil Popov, PhD (FEA), tel.: 032 659 528, e-mail: vasil_popov@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Eelective subject from the curriculum / curricula for training of students to obtain Bachelor's degree, specialty Mechatronics, Professional orientation 5.1 Mechanical Engineering, 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 methodology for modelling, simulation and control of robotic systems, to have basic knowledge on simulation software (MATLAB, SIMULINK,WEBOTS) and use it in solving of engineering problems, analysis and validation of the results.

DESCRIPTION OF THE COURSE: Problems related to the description and classification of robot manipulators, modelling of mechanics and kinematics for joints, links and gripper, inverse kinematics, determination of dynamical models, state-space representation and linearization of nonlinear models, control of robots, including independent joint control, computed-torque control, force control, trajectory planning and control..

PREREQUISITES: Control Theory, Elements of Industrial Automation, Electrical Engineering, Electronics, Computing, Fluid Mechanics, Physics, Thermodynamics, Industrial Manufacturing Systems.

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

METHOD OF ASSESSMENT: Written exam (80%), laboratories (20%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. John Craig, Introduction to Robotics: Mechanics and Control, 2nd ed., Addison Wesley, 1989. 2. F. L. Lewis, C. T. Abdallah, D. M. Dawson, Control of Robot Manipulators, Macmillan, 1993. 3. L. Sciavicco, B. Siciliano, Modelling and Control of Robot Manipulators, Springer, 2000.

DESCRIPTION OF THE COURSE

Name of the course **Intelligent Manufacturing Systems**	Code: **BpMEH24.2**	Semester: **8**
Type of teaching: Lectures, Laboratory Work	Lessons per semester: L – 30 hours, LW – 15 hours	Number of credits: **4**

LECTURER:

Asst. Prof. Dr. Sabi Sabev (Faculty of Mechanical Engineering) sabi_sabev@tu-plovdiv.bg;

TU-Sofia, Plovdiv Branch

COURSE STATUS IN THE CURRICULUM: Compulsory subject in the curriculum for the major "Mechatronics", Bachelor's degree.

AIMS AND OBJECTIVES OF THE COURSE: After completing the course the students should be familiar with the technological properties of the metal CNC machine tools HAAS, the principles of designing technological operations and control programs. They should also be able to develop operation technologies and control programs for them.

DESCRIPTION OF THE COURSE: Basic topics: sphere of application and technological properties of metal CNC machine tools; working space and coordinates; structure of the control program and programming moves, dimensions, cutting modes, instruments and auxiliary actions; standard and multiple-thread cycles; parameter programming; specific characteristics of the billet and instruments location; dimension adjustment and sub-adjustment, corrections of the instruments; design of technological operations for lathes and milling machines HAAS.

PREREQUISITES: It is necessary to study in advance or parallel disciplines: Technical Drawing, Material Science and Technology of Materials, Fundamentals of Design and CAD

TEACHING METHODS: Lectures visualized by slides and laboratory work with written statements about the research (the observations), the widely used metal CNC machine, which are located in the laboratory of Department of Mechanical Equipment and Technologies.

METHOD OF ASSESSMENT: Written examination on a topic drawn by the student or filling in an examination test-paper covering the whole content of the subject.

INSTRUCTION LANGUAGE: Bulgarian.

BIBLIOGRAPHY: 1. Хаджийски П. Програмиране и настройване на металорежещи машини с ЦПУ, С., ТУ, 2005, 2. Пламен Угринов, Програмиране и настройване на металорежещи машини с ЦПУ София, 2018 г.

DESCRIPTION OF THE COURSE

Name of the course: **Optoelectronics and laser engineering**	Code: **BpMEH25.1**	Semester: **8**
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S) Course work (CW)	Hours per semester: L – 30 hours S – 0 hours LW – 15 hours	Number of credits: **4**

LECTURER(S):

Assoc.Prof. Eng. Margarita Deneva, PhD (FEA), tel.: 659 759,e-mail: deneva@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory elective subject from the curriculum for training of students to obtain Bachelor's degree, specialty Mechatronics, Professional orientation 5.1 Mechanical Engineering, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: Quantum and optoelectronics refer to the most modern new scientific and technical achievements with wide potential for solutions in new and effective ways of tasks of material processing, control and management in mechanical engineering, measurement, geodesy, ecology, medicine, military affairs and others. The course aims to acquaint students professionally with the basic principles, devices and elements of quantum electronics (lasers) and optoelectronics. Their properties of interest for their practical applications in the marked areas and the approaches for these applications will be presented, illustrated with key specific examples.

DESCRIPTION OF THE COURSE: The topics that will be considered are related to the principles of operation of laser devices, basic approaches and designs for the creation of lasers, as well as optoelectronic devices. The properties and control of laser radiation of interest for industrial applications will be considered. The exposition will cover the main laser sources and the main optoelectronic elements. Issues of measuring the characteristics of laser sources and optoelectronic elements, as well as the approaches and means of connection in applied systems and safety techniques when working with laser radiation will be discussed in detail.

PREREQUISITES: University courses in Physics, Mathematics, Electrical and Electronic Engineering, Optics.

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

METHOD OF ASSESSMENT: Current assessments at the end of the semester (total 75%), laboratory exercises (25%)

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: М. Денева, М. Ненчев, “Лазерното лъчение в представяне за инженери и приложници”, изд. Интелексперт-94, ISBN 978-954-8835-76-3, (2013); М.Ненчев, С.Салтиел, "Лазерна техника", Изд. "Наука и изкуство" и Изд. на СУ "Св.Кл.Охридски", 1994г.;С. Динев, „Лазерите в модерните технологии, Изд. АЛФА, 1993; “Handbook of Optoelectronics”, Vol.I, ed. J.P.Dakin and R.G.W. Brown, Taylor&Francis Group, New York and London, 2006.

DESCRIPTION OF THE COURSE

Name of the course: **Synthesis, kinematics and dynamics of robots**	Code: **BpMEH25.2**	Semester: **8**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 15 hours	Number of credits: **3**

LECTURER(S):

Assoc. Prof. Angel Lengerov, PhD (MIE), E-mail: anlen@tu-plovdiv.bg,

Technical University of Sofia, branch Plovdiv

COURSE STATUS IN THE CURRICULUM: Elective course from the curriculum for training students for bachelor's degree, specialty "Mechatronics", professional field 5.1 Mechanical Engineering, field 5. Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is for students to learn to analyze and synthesize the kinematic structures of robots, kinematic, force and dynamic analysis, rational choice of drive mechanisms, determination of basic technical characteristics such as: positional and trajectory accuracy, speeds of movement of the executive body, power and dynamic characteristics of the robot.

DESCRIPTION OF THE COURSE: Systematics of the necessary movements for moving and action with tools and objects. Structural synthesis and analysis of kinematic circuits for manipulation and mobile robots. Methods for solving the rights and inverse problem for kinematic analysis of manipulation robots. Metric synthesis and kinetostatic analysis. Drive systems. Gripping devices and end effectors of manipulation robots. Accuracy of robots. Mobile robots for industrial and general purpose. Dynamic modeling and research. Applications of the models in the main tasks of building the control of robots. Virtual CAD models for robot analysis using modern CAD products (Solid Works, etc.)

PREREQUISITES: "Mathematics", "Mechanics", "Theory of mechanisms and machines", "Machine elements", "Resistance of materials", "Elements and mechanisms of mechatronic systems", "Fundamentals of design and mechatronic systems", etc.

TEACHING METHODS: The lectures are conducted with the help of a projector, through which diagrams, tables, graphs and illustrative materials are designed. The laboratory exercises are conducted in a computer class and are training to work with specific design systems.

METHOD OF ASSESSMENT: Exam

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1. Ташев, М.Д. Инженерен анализ с CAE системи, Пловдив, 2015; 2. Solidworks Simulation tutorials; 3. Ташев, М.Д. COSMOSWorks – обучение с примери. Ч. 1 ТУ-София, Филиал Пловдив, 2006; 4. Ташев, М.Д., Ст. Николов COSMOSWorks – обучение с примери. Ч. 2 ТУ-София, Филиал Пловдив, 2006; 5. Solidworks Simulation Online User's Guide; 6. Янакиев И., Ст. Николов, CAD/CAM/CAE системи в мапиностроенето, София, 2010; 7. Тенчев Р.Т. Метод на крайните елементи (Ръководство за работа с COSMOS/M) ТУ-София 1998г.; 8. Чакърски Д., Т. Вакарелска. Инженерни изследвания и симулационно моделиране. Учебник. ИК на ТУ – София, 2008; 9. Тодоров Н., Д.Чакърски. Автоматизация на проектирането в машиностроенето. С., Техника, 1994; 10. Чакърски Д., В. Георгиева, И. Янакиев. Ръководство за лабораторни упражнения по автоматизация на проектирането.; ИК на ТУ – София, 2005; 11. Чакърски и к-в. Промишлени роботи, роботизирани технологични модули и системи. Част 2. ИК на ТУ – София, 2003.

DESCRIPTION OF THE COURSE

Name of the course: **Practicum**	Code: **PRC04**	Semester: 8
Type of teaching: Lectures (L) Laboratory work (LW) Self-Study (SS)	Hours per semester: L – 0 hours LW – 0 hours SS – 60 hours	Number of credits: **2**

LECTURER(S):

Assoc. Prof. Angel Lenegerov, PhD (FME), tel: 032 659 613 e-mail: anlen@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curricula for training of students to obtain Bachelor's degree, specialties Mechanical Engineering and Instrumentation, Mechatronics, Computer Modelling and Mechanical Engineering, Professional orientation 5.1 Mechanical engineering; specialties Transport Machinery and Technology, Aeronautical Engineering, Professional orientation 5.5 Transport, Navigation and Aviation, specialties Industrial Management, Graphic Design and Printing, Professional orientation 5.13 General Engineering, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: Introducing to students with metal cutting machines, metal cutting tools, devices, metal processing by cutting.

DESCRIPTION OF THE COURSE: The main topics concern: Studying provided in the curriculum subjects at the end of the course students will be able to design processes of some of the most complex products in engineering.

PREREQUISITES: Material Science, Mechanics, Practicum (PRC01).

TEACHING METHODS: Protocols for the results of research (observations).

METHOD OF ASSESSMENT: Oral examination on the subject withdrawn by the student.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1. Хаджийски П. Програмиране и настройване на металорежещи машини с ЦПУ, С., ТУ, 2005, Събчев П. М. Металорежещи инструменти, Техника, С., 1982, Палей М. М. Технология производства приспособления, пресформ и щанц. Машиностроение, М., 1971.