DESCRIPTION OF THE COURSE

Name of the course: **Engineering metrology**	Code: **BpMEH01**	Semester: **5**
Type of teaching: Lectures (L) Laboratory work (LW) Seminary work(SW)	Hours per semester: L – 30 hours SW – 0 hours LW – 30 hours	Number of credits: **5**

LECTURER(S):

Assoc. prof. Pavlinka Katsarova Ph.D , department (MIE), e-mail: p_katsarova@abv.bg,
Assist. Prof. Eng. K. Georgiev, 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 metrology and measurement techniques and to acquire skills for solving applied problems.

DESCRIPTION OF THE COURSE: The curriculum includes lectures, laboratory work and course work. The basics of metrology, analysis and evaluation of measurement errors, metrological characteristics and application of measuring instruments are considered. The principles for defining and standardizing the requirements for the accuracy of the details, their interchangeability, as well as the modern concepts for analysis and solving problems of dimensional analysis. In the laboratory exercises practical skills for working with measuring instruments and solving applied problems by choosing assemblies and dimensional circuits are acquired.

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

TEACHING METHODS: Lectures delivered with the help of visual presentations, slides and videos. Laboratory exercises with the use of stands, methodical instructions and drawing up protocols. Work with various devices for technical measurements, performance of independent tasks, independent solution of applied course tasks from dimensional analysis.

METHOD OF ASSESSMENT: Exam in the form of a test, forming 70% of the total grade, laboratory exercises - 20%, course assignment - 10%.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Радев Хр. и др., Метрология и измервателна техника (в три тома), С., Софттейд, 2008,2010; 2. Харт Х. Въведение в измервателната техника, С. Техника, 1982; 3. Димитров Д., Взаимозаменяемост, стандартизация и технически измервания, С. Техника, 1982; 4. Радев Хр., Уреди за измерване на линейни и ъглови размери, С., Техника 1989; 5. Димитров Д. и др., Ръководство за лабораторни упражнения по взаимозаменяемост и технически измервания. С., Техника, 1989; 6. Яръмов К., Р. Йорданов, Ръководство за решаване на курсови задачи по взаимозаменяемост, С., Софттрейд.

DESCRIPTION OF THE COURSE

Name of the course: **Automation of discrete production**	Code: **BpMEH02**	Semester: **5**
Type of teaching: Lectures(L) Laboratory work (LW)	Hours per semester: L – 45 hours LW – 15 hours	Number of credits: **5**
Course project (CP)	Code: **BpMEH07**	Number of credits: **3**

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 training in "Automation of discrete production" is to acquaint students with the essence, basic concepts, prerequisites for automation and robotics, methods and technical means for automation and robotics of various technological processes, as well as the implementation and operation of automation equipment.

DESCRIPTION OF THE COURSE: The main directions for ADP, the methods applicable in the design and implementation of projects for automation and robotics of various discrete processes are considered. The main attention is paid to the constructions, areas of application, design and implementation of the main classes of automation equipment with different degrees of automation.

PREREQUISITES: Basic knowledge of "Mathematics", "Mechanics", "Theory of Mechanisms and Machines", "Machine Elements", knowledge of "Technology of Mechanical Engineering", "Quality Control", "Control and Control Equipment", "Automation and Robotics" of production ",“ Engineering graphics ”.

TEACHING METHODS: Lectures delivered using illustrative materials, including: multimedia, foils for overhead projects, boards, etc. Laboratory exercises conducted in a specialized laboratory in the presence of laboratory stands and manuals for laboratory exercises. For experimental research, students prepare protocols, which are accepted by the teacher.

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 **Production Technologies**	Code: **BpMEH03**	Semester: 5
Type of teaching: Lectures, (L) Laboratory work (LW)/Seminars (S)	Hours per semester: L – 30 hours LW – 15 hours	Number of credits: 4

LECTURER:

Assoc. Prof. Dr. Angel Stoilov Poparov, Eng. (Faculty of Mechanical and Instrument Engineering), tel: 359 32 659 617; e-mail: poparan@abv.bg,
TU-Sofia, Plovdiv Branch

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curricula for training of students to obtain Bachelor's degree, specialtiy Mechatronics, 5.1 Mechanical engineering, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: After completing the course, the students should know the basic principles of providing machine-building articles quality in the process of their production, the factors that influence quality and the technological properties of the methods of mechanical processing, as well as to be able to make analysis of the technological processes condition and of the quality disturbance sources.

DESCRIPTION OF THE COURSE: Basic topics: Production and technological process, types of machine-building production, production organization forms; quality of the articles; precision of the machine-building articles, types of mistakes and methods of ensuring precision; stability of the technological system and methods of reducing the power distortion mistakes; dimension set-up and sub-adjustment of the technological system; ensuring the quality of the processed surfaces; statistical analysis and technological processes control; active and adaptive control; methods of rough, pure and finishing processing; designing technological processes.

PREREQUISITES: Materials Science and Technology of Materials; Metrology and Measuring Equipment; Metals Cutting; Cutting Tools; Metal-cutting Machines.

TEACHING METHODS: Lectures supported by slides, laboratory work with written statements about the research (observations) results.

METHOD OF ASSESSMENT: Written examination on a topic, drawn by the student, or examination test covering the whole content of the subject.

INSTRUCTION LANGUAGE: Bulgarian.

BIBLIOGRAPHY: 1.Георгиев В., Ст. Пашов. Технология на машиностроенето, ТУ-София, Филиал Пловдив, 2003. ISBN 954-8779-51-X; 2.Пашов Ст., П. Хаджийски. Технология на машиностроенето част 1. ИПК ТУ - София, 1997. ISBN 954-438-203-8; 3.Гатев Г.К., В.И. Георгиев. Ръководство за лабораторни упражнения по технология на машиностроенето, София, “Техника”, 1987.

DESCRIPTION OF THE COURSE

Name of the course: **Elements and mechanisms of mechatronic systems**	Code: **BpMEH04**	Semester: 5
Type of teaching: Lectures (L) Laboratory work (LW) Seminary work(SW)	Hours per semester: L – 30 hours SW – 15 hours	Number of credits: 4

LECTURER(S):

Assist. Prof. Eng. Dimitur Dimitrov PhD, (MIE), e-mail: ddimitrov_tu@abv.bg,
Technical University-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 purpose of the training in "Elements and mechanisms of mechatronic systems" is to expand and supplement the knowledge of students from previous courses in TMM and Machine Elements. This will allow them to more competently solve the tasks of designing mechanical structures.

DESCRIPTION OF THE COURSE: The general principles and methods for design and calculation of some basic elements and mechanisms applied in the devices and devices of the fine mechanical engineering are presented. Specific fine-mechanical elements and mechanisms, their main characteristics, accuracy indicators, choice of materials, construction, application are considered.

PREREQUISITES: Basic knowledge of "Theory of Machines and Mechanisms" and "Machine Elements" is required.

TEACHING METHODS: Lectures delivered with the help of visual aids, boards and slides. Laboratory exercises performed according to the Manual and protocols, made by the students and checked by the teacher.

METHOD OF ASSESSMENT: Current assessment in the fifth semester

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Недев Ц. и кол., Основи на проектирането на уредите, София, Техника, 1991г.; 2. Недев Ц., Елементи на уредите и машините, София, Техника, 1979г.; 3. Лилов А., Николов Р., Ръководство за лабораторни упражнения по финомеханична техника", София, Софттрейд, 2003г.; 4. Becwith T., Marangoni R., Lenhart Y., Mechanical Measurement, Massachusetts, 1993.; 5.Mechanisms and Machines : Kinematics, Dynamics and Synthesis, by Michael M. Stanisis , Feb 28,2014; 6.A Textbook of Mechatronics, by RK Rajput, Mar 9,2021; 7.Mechatronics:A Foundation Course , by Clarence W. de Silva, Jun 4 , 2010

DESCRIPTION OF THE COURSE

Name of the course: **Microelectronics**	Code: **BpMEH05**	Semester: **5**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 15 hours LW – 15 hours	Number of credits: **5**

LECTURER(S):

prof. Tsevetana Grigorova, PhD, e-mail: c_gr@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Elective 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: Introduction to the basic technological processes in microelectronics; basic microelectronic elements;basic knowledge of microelectronic circuits and Microelectromechanical Systems (MEMS). Graphical user interface Active-HDL for design development, starting from a hardware description.

DESCRIPTION OF THE COURSE: Basic subjects: **Introduction:** Main characteristics. Basic concepts. Stages of development. Materials in microelectronic production. **Technological processes in microelectronics:**Classification of technological processes.Forming semiconductor junctions and layers.Thin insulating and conducting layers. Cleansing and removing thin layers. Transfering the topographic image . Assembly of elements. **Microelectronicelements:** Classificationandstructure. Hybrid Integrated Circuits. BipolarandMOSelements. **Microelectroniccircuits**: Basic elements. Analog Integrated Circuits. Digital integrated circuits. Memory - types, organization. Specialized modules. Microelectromechanical Systems (MEMS): General Information. MEMS sensors and actuators.Active-HDL is a new generation VHDL simulator. Its context graphical user interface starting from a hardware description, through synthesis, implementation, and debugging to design simulation.

PREREQUISITES: Courses of Physics, Semiconductor devices, analog circuits, electronics measurements.

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. Laboratory work..

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

INSTRUCTION LANGUAGE: Bulgarian,English

BIBLIOGRAPHY:
1.Атанасов,А.С.,Основи на микроелектрониката, С., Техника 1987; 2. Вълков, С. А., Микроелектронна схемотехника, София, Техника 1987; 3. Razavi, B., Fundamentals of Microelectronics, 2007, ISBN / ASIN: 047007292X; 4. М. Христов, Системи за проектиране в микроелектрониката, София, 2004г.; 5. Campbeli, St., The Science and Engineering of Microelectronic Fabrication, Oxford University Press, 2001; 6. MEMS Introduction and Fundamentals, © 2006 by Taylor & Francis Group, LLC.

DESCRIPTION OF THE COURSE

Name of the course: **Fundamentals of the design of mechatronic systems**	Code: **BpMEH06**	Semester: 5
Type of teaching: Lectures (L) Laboratory work (LW) Seminary work(SW)	Hours per semester: L – 45 hours LW – 15 hours	Number of credits: 5

LECTURER(S):

Assoc. Prof. Angel Lengerov, PhD (MIE), E-mail: anlen@tu-plovdiv.bg,
Technical University-Sofia, branch Plovdiv

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 of the training is for students to gain basic knowledge of the characteristic methods and tools in the design of typical mechatronic systems.

DESCRIPTION OF THE COURSE: The course studies: the typical structure and principles of building mechatronic systems, the nature of the system approach and design stages, features of the pre-design design stage, basic methods for building mechatronic systems, basic mechatronic functional modules - mechanical, sensory, propulsion, control and others, systems and means for design and rapid prototyping, etc.

PREREQUISITES: The knowledge acquired from the training in the courses "Mechanics", "TMM", "Resistance of materials", "Machine elements", as well as knowledge in "Electrical engineering and electronics" are required.

TEACHING METHODS: The lectures are delivered with the help of video presentations. During the laboratory exercises, tasks are performed in a CAD environment.

METHOD OF ASSESSMENT: The assessment is formed on the basis of the work in the laboratory exercises and by a control test (theoretical and practical part) at the end of the semester.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Klaus J., Mechatronic Systems Design - Methods, Models, Concepts, Springer, New York, ISBN 978-3-642-17530-5, 2012. 2. Devdas S., Richard A. K., Mechatronics system design - Second Ed, SI Version, eBook ISBN: 9781133378020, 2011. 3. S. Cetinkunt, Mechatronics with experiments – Second Ed., John Wiley&Sons Ltd, ISBN 978-1-118-80246-5, 2015. 4. Alciatore D.G., Introduction to mechatronics and measurement systems — 4th ed., Published by McGraw-Hill, ISBN 978-0-07-338023-0, 2012. 5. Musa Jouaneh, Fundamentals of Mechatronics, Publisher: Global Engineering-Christopher M. Shortt, USA, ISBN-13: 978-1-111-56901-3, 2013. 6. Готлиб Б. М. Проектирование мехатронных систем.– Екатеринбург: УрГУПС, 2007. 7. Грабченко А.И. и др.., Введение в мехатронику: – Х.: НТУ "ХПИ",ISBN 978-966-303-527-7, 2014. 8. Егоров О.Д., Подураев Ю.В., Разчет и конструирование мехатронных модулей, Москва, ГОУ ВПО МГТУ "Станкин", ISBN 978-5-7028-0750-8, 2012. 9. Курс: Основи на проектирането на мехатронни системи (tu-plovdiv.bg)

DESCRIPTION OF THE COURSE

Name of the course: **Optical technique**	Code: **BpMEH08**	Semester: 5
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 30 hours	Number of credits: 4
Course project (CP)	none	**none**

LECTURER(S):

Assoc. Prof. Margarita Deneva, PhD (FEA),

Assist.. Prof. Eng. Valeri Bakardzhiev, PhD (FME), tel.:659 519, e-mail:bakardzhiev@tu-plovdiv.bg

Assist. Eng. Georgi Raynov, (FME), tel.: 659 513, e-mail: raynov@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory course from the curriculum for students of Bachelor's degree, specialty "Mechatronics", professional field 5.1 Mechanical engineering, area 5. Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The course deals with the basic concepts of optics, the types of optical components and the basic types of optical tools. During the lecture cours, students learn the manufacturing stages of optical components. The course is practical. It develops the logical and analytical thinking necessary for their work as future professionals.

DESCRIPTION OF THE COURSE: Main topics: 'Introduction to the course', 'Geometrical optics', 'Magnifiers, eyepieces and microscopes', 'Lenses', 'Telescopes', 'Optical tools', 'Colorimetry', 'Manufacture of optical components'.

PREREQUISITES: Machine Elements, Theory of Machines and Mechanisms, Engineering Metrology.

TEACHING METHODS: Lectures using slides and demo programs, laboratory work with protocols.

METHOD OF ASSESSMENT: Written examination (80%), laboratory work (20%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Иванчев, Н., Алахверджиева, Д. Оптика и оптични уреди, Техника, 1987, София. 2 Brown, N. J., Cook L. M., The role of abrasion in the optical polishing ofmetals and glasses, The Science of Polishing Topical Meeting, Technical, Digest,1984 3. Karow, H, Fabrication methods for precision optics, Wiley, 2004, 768p. ISBN: 978-0-471-70379-2;.

DESCRIPTION OF THE COURSE

Name of the course: **Programming of automatic production machines**	Code: **BpMEH09**	Semester: **6**
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. 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 course considers the programming of industrial robots as an integral stage in the development of a modern production structure. Various possibilities for embedding robots in flexible, automated production as programmable tools for manipulating parts and tools are presented. Layout schemes and technological capabilities of modern CNC machines are considered. Various machine control systems are described, as well as tooling, technological equipment, work organization, control and diagnostics in flexible production systems. The students get acquainted with the efficiency of the work of the cutting tools in the conditions of GAPS.

DESCRIPTION OF THE COURSE: The operation of industrial robots (IR) is related to: the analysis of productivity, the importance and tasks for solving in rational operation, reduction of downtime, maintenance, reliability, repair and service of IR; Intelligent IR, built into automatic robotic modules and complexes. The various programming methods, ways to define the trajectory of movement, declarations, as well as an algorithm for program development are considered. The main activities related to the normal operation, maintenance and repair of PR are given. Automated production systems, types, prerequisites, historical aspects, stages of development, main problems. Prerequisites for building flexible production structures, definitions, classification. Approaches for programming different CNC machines. Features in programming with subroutines, macro programming, and dialog programming. Ensuring the flow of tools, technological equipment and workpieces in flexible systems. Reviewed are also methods for programming of PLCs.

PREREQUISITES: Basic knowledge of "Mathematics", "Theory of Mechanisms and Machines", knowledge of "Technology of Mechanical Engineering", "Quality Control", "Regulating and control technology", "Automation and robotics of production" are required.

TEACHING METHODS: Lectures using slides and company catalogs in laboratory work.

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

DESCRIPTION OF THE COURSE

Name of the course: **Sensors and actuators**	Code: **BpMEH10**	Semester: **6**
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S)	Hours per semester: L – 30 hours LW – 15 hours	Number of credits: **4**
Course project (CP)	Code: **BpMEH10**	Number of credits: **3**

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: 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: Aim of the course is to provide mechanical engineering students with detailed knowledge about the types of sensors and actuators in 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: 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 (72%), laboratories (28%).

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: **Industrial robots**	Code: **BpMEH11**	Semester: **6**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 30 hours	Number of credits: **5**
Course project (CP)	Code: **BpMEH14**	Number of credits: **3**

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-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 the structure, principle of operation, technical characteristics and areas of application of modern industrial robots.

DESCRIPTION OF THE COURSE: The problems in the development, production, implementation and operation of industrial robots are considered. The main attention is paid to methods for solving problems in the different stages of the life cycle of industrial robots. The possibilities for reducing the terms for development and the costs for industrial robots by applying the aggregate-modular principle of construction are considered. The issues related to the construction of optimal parametric rows of modules for industrial robots - modules for translation, rotation and gripping devices are studied. Due attention has been paid to the programming and tuning of industrial robots. Exemplary structures and structural-layout solutions for automation of characteristic discrete operations with the help of industrial robots are considered.

PREREQUISITES: Basic knowledge acquired from the training in the courses "Mathematics", "Mechanics", "Machine Elements", "TMM", "Resistance of Materials", as well as knowledge in "Electrical Engineering and Electronics" are required.

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 (60%) and a laboratory exercise grade (40%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1.Чакърски Д., Г. Хаджикосев, „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. Записки от лекции по АРП, Иван Шопов, изд. Имеон, Пловдив,2020, ISBN 978-619-7570-16-8 7. Автоматизирани производствени системи, изд. Имеон, Пловдив, 2020, ISBN 978-619-7570-15-1.

DESCRIPTION OF THE COURSE

Name of the course: **Measuring Equipment**	Code: **BpMEH12**	Semester: 6
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 30 hours LW – 30 hours	Number of credits: **5**
Course project (CP)	Code: **BpMEH14**	Number of credits: **3**

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 "Mechatronics", professional field 5.1 Mechanical Engineering, field 5. Technical sciences.

AIMS AND OBJECTIVES OF THE COURSE: To create in students an understanding and approach in solving various metrological problems, as well as practical skills for working with instruments for measuring geometric and physicomechanical quantities.

DESCRIPTION OF THE COURSE: The curriculum includes lectures, laboratory work and optional course work. The lectures cover two modules. The first deals with issues related to the accuracy of measuring instruments. The second is dedicated to the methods and means for measuring edematous physicomechanical quantities and geometric quantities. The principles of operation, device and metrological characteristics of specific measuring instruments are considered. The laboratory exercises complement the lecture material by being connected to the measuring instruments. The course work is optional between the disciplines "Measuring equipment" and "Microtechnics" and consists in solving a specific measuring task or project related to the principles of operation of various instruments.

PREREQUISITES: Basic knowledge of the previously studied disciplines physics, mechanics, engineering metrology, signal theory and measuring transducers, materials science and design.

TEACHING METHODS: Lectures using slides, POWER POINT presentation and study models. Laboratory exercises with the use of stands, methodical instructions and drawing up protocols.

METHOD OF ASSESSMENT: Exam

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: Метрология и измервателна техника, под ред. На проф. д.т.н. Хр. Радев, С., Софттрейд, 2008; Харт Х., Въведение в измервателната техника, С., Техника, 1982; Троянов Б., Уреди за измерване на физико-механични величини, С., ТУ, 1990, Радев Хр., Уреди за измерване на линейни и ъглови размери, С., Техника, 1989.

DESCRIPTION OF THE COURSE

Name of the course: **Technical logistics**	Code: **BpMEH13**	Semester: **6**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 15 hours LW – 15 hours	Number of credits: **3**

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 engineering logistics. Students gain knowledge about the logistics system and methods for moving material flows in different logistics systems. Skills for solving various logistical tasks related to the movement of material flows.

DESCRIPTION OF THE COURSE: Logistics as a science, goals and main tasks are considered. Flows in logistics and logistics operations, The basic principles of movement of material flows in logistics systems. Types of logistics strategies. Methods for planning in logistics. Planning of capacities in logistics. JIT "just in time" concept. The different subsystems in the logistics chain are considered - transport, information, warehousing, supply and finance. In the laboratory exercises students solve various engineering logistics tasks - transport, warehousing and information.

PREREQUISITES: Knowledge of "Mathematics", "KUK", "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 the performance of independent applied tasks.

METHOD OF ASSESSMENT: Exam test on the lecture course and the applied tasks. The assessment is formed by 80% of the test and 20% of the independently solved tasks of laboratory exercises.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Записки от лек.курс на водещият преподавател—доц д-р П. Кацарова, 2. Коралиев Я., (2000), Складова логистика, ISBN 954-683-126-3., 3. Казаков Н., (2001), Логистика, ISBN 954-9725-27-8, 4.Македонска, Д., Казаков, Н., Димитров, И., (2001), Основи на логистиката, ISBN 954-90948-1-2.

DESCRIPTION OF THE COURSE

Name of the course: **Practicum**	Code: **PRC03**	Semester: 6
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.