DESCRIPTION OF THE COURSE

Name of the course: **Control and quality management**	Code: **BpME15**	Semester: 7
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 15 hours LW – 15 hours	Number of credits: 6

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 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**	Code: **BpME16**	Semester: **7**
Type of teaching: Lectures(L) Laboratory work (LW)/Seminars (S) Course work (CW)	Hours per semester: L – 30hours S – 30 hours LW – 0 hours	Number of credits: **6**

LECTURER(S):
Assoc. Prof. Toni Mihova, PhD (FME), tel.: 0893 69 06 55, e-mail:mihova@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: The course"Economy"is included as mandatory for Bachelor degree students in Mechanical and instrument engineering

AIMS AND OBJECTIVES OF THE COURSE: Learning fundamentals and modern condition of dynamic economical processes in way students to be able to analyse ongoing economical processes in mechanical engineering enterprise as system

DESCRIPTION OF THE COURSE: TheMain topics:Capital and assets in enterprise, production capability, material economy, human resources in enterprise. Costs and cost price. Pricing. Disposal and sales. Effectiveness of enterprise activity. Investments.

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

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 0,50 and assessment of the performance during seminarswith a factor of 0,50..

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:1. 1.Donchev, D.,and others,Economy of enterprise,Sofia,2020. 2.Deneva,A.,Gutsev,G.,Industrial economy,Avangard print 2008 3 Popov G.,Marinova U.,Economy and organization of company,Gorexpress 2006 . 4. Mihova. T.,Economy of enterprise,Macros,Plovdiv 2017. 5 Donchev,D.,Velev,Ml.,Dimitrov,I.,Bussiness economySoftrade 2003. 6 Marinov,G.,Velev,Ml., and others Economy of investment activity 2001. 7. Boyadjieva,E., and others Economy of enterprise,part 1 Dionis, 2006. 8 Chausheva,V., and others Economy of enterprise part 2,Dionis,Sofia. 9 Economy of enterpirse part 3,Dionis,Sofia,2008...

DESCRIPTION OF THE COURSE

Name of the course: **3D prototypes**	Code: **BpME17**	Semester: 7
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 25 hours LW – 15 hours	Number of credits: 5

LECTURER(S):

Assoc. Prof. Eng. Milcho Tashev, PhD (MIE), tel.: 659 660, e-mail: m_tashev@abv.bg
Assist. Prof. Eng. Adelina Vasileva, PhD (MIE), tel.: 659 590, e-mail: adelina.bogoeva@abv.bg
Assist. Prof. Eng. Kristina Petkova, (MIE), tel.: 659 590, e-mail: k.petkova@tu-plovdiv.bg,
Assist. Prof. Eng. K. Georgiev, department (MIE), e-mail: k.georgiev@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 "Mechanical Engineering and Instrument Making", 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 consolidate their knowledge of "Machine Elements" and "Engineering Graphics". Upon completion of the course, students should be able to construct a given mechanism. To create a 3D model of the mechanisms. To print a functional prototype of the mechanisms by 3D printing.

DESCRIPTION OF THE COURSE: Main topics: Overview of mechanisms for 3D prototypes. 3D modeling programs. Preparation of technical documentation. Mechanisms suitable for printing. Different types of 3D printers and how to work with them. Materials for 3D printing. Requirements for 3D printing. Printing errors. Solve problems when printing details.

PREREQUISITES: Basic knowledge of "Machine Elements", "Engineering Graphics", "Theory of Machines and Mechanisms", "Electronics and Electrical Engineering", "Metrology and Measurement Technology".

TEACHING METHODS: Lectures using slides and demo programs, laboratory exercises in a computer room.

METHOD OF ASSESSMENT: The current grade is formed taking into account the grade from the control on the material from lectures (50%) and the grade from the laboratory exercises (50%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1. Ligon S., Liska R. Polymers for 3D Printing and Customized Additive Manufacturing, 2017; 2. Ngoa T.D., Kashania A., Additive manufacturing (3D printing): A review of materials, methods, applications and challenges, 2018; 3. Berman B., 3-D printing: The new industrial revolution, 2012; 4. Zeltmann S.E., Gupta N., Manufacturing and Security Challenges in 3D Printing, 2016.

DESCRIPTION OF THE COURSE

Name of the course: **Metrology and measuring equipment II**	Code: **BpME18.1**	Semester: 7
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 25 hours LW – 15 hours	Number of credits: 5
Course project (CP)	Code: **BpME20**	Number of credits: **4**

LECTURER(S):

Assoc. prof. Pavlinka Katsarova Ph.D , department (MIE), e-mail: p_katsarova@abv.bg,
Assist. Prof. Eng. Dimitur Dimitrov PhD, (MIE), e-mail: ddimitrov_tu@abv.bg,
Technical University of Sofia, Plovdiv Branch

COURSE STATUS IN THE CURRICULUM: Compulsory elective 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: Students must acquire knowledge and skills to work with technical means for measuring physical and mechanical quantities, to know the capabilities of modern measuring instruments in this field, as well as to apply what has been learned in the metrological support of various industries.

DESCRIPTION OF THE COURSE: Main topics: Structural and structural-functional means, transmission characteristics; Methods and principles for mass measurement; Methods and principles for measuring forces, moments, pressure and temperature; Measurement of flow and velocity of fluid flows; Methods and principles for measuring time; Speed measuring and measuring instruments; Measurement of mechanical oscillations, etc.

PREREQUISITES: Basic knowledge of "Physics", "Informatics", "Metrology and measuring equipment" and "Measuring transducers".

TEACHING METHODS: Lectures are held with the help of a projector, through which drawings, figures and graphics are presented. During the laboratory exercises various topics are considered under the guidance of the teacher.

METHOD OF ASSESSMENT: Take into account the evaluation of the laboratory exercises and the control in order to form an ongoing evaluation.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Fundamentals of Dimensional Metrology 6 th Edition , by Connie L. Dotson, Jan 1,2015; 2.The Metrology Handbook 2 nd Edition, by Jay L. Bucher , Jul 26, 2012; 3. Metrology Handbook: Understanding the Basics of Metrology, Jan 15,2021; 4. Theory and Design for Mechanical Measurements 6 th Edition, by Richard S. Figliola, Donald E.Beasley, 2020.

DESCRIPTION OF THE COURSE

Name of the course: **Design of elements for small arms (ammunition)**	Code: **BpME18.2**	Semester: **7**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 25 hours LW – 15 hours	Number of credits: **5**
Course project (CP)	Code: **BpME20**	Number of credits: **4**

LECTURER(S):

Assoc. Prof. Angel Lengerov, PhD , E-mail: anlen@tu-plovdiv.bg,
Technical University of Sofia, Plovdiv Branch

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 introduces students to the methods of designing elements for small arms (ammunition)..

DESCRIPTION OF THE COURSE: Main topics: design of elements for small arms (ammunition).

PREREQUISITES: Theoretical mechanics, resistance of materials, physics, mathematics, thermodynamics, basics of heat transfer.

TEACHING METHODS: Lectures and laboratory work.

METHOD OF ASSESSMENT: Lectures and laboratory work

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: All available scientific literature sources for design of elements for small arms (ammunition).

DESCRIPTION OF THE COURSE

Name of the course: **Automation of control**	Code: **BpME18.3**	Semester: 7
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 25 hours LW – 15 hours	Number of credits: 5
Course project (CP)	Code: **BpME20**	Number of credits: **4**

LECTURER(S):

Assoc. prof. ENG. Pavlinka Katsarova PhD (MIE), tel.: 659 636, e-mail: p_katsarova@abv.bg

Technical University-Sofia, branch Plovdiv

STATUS OF THE COURSE IN THE CURRICULUM: The discipline is elective List 4 for the bachelor's course of the specialty "Mechanical engineering " of FMU of TU-Sofia Plovdiv Branch for the educational-qualification degree "Bachelor".

PURPOSE OF THE COURSE: The aim of the course is for students to study the nature of active and passive control and to be able to apply the methods and technical means for design, manufacture, research and maintenance of control machines and semi-automatic machines.

DESCRIPTION OF THE COURSE: Metrological features of automatic control, electrocontact devices for automatic control, pneumatic measuring devices for automatic control, electronic and optoelectronic measuring devices, active dimensional control in mechanical engineering, accuracy of processing in conditions of active control, automation of passive dimensional control are considered in mechanical engineering, economic efficiency of automatic control.

PREREQUISITES: Prerequisites: Knowledge of Metrology, Measuring Equipment, Mechanical Engineering Technology, Production Automation and Robotics.

TEACHING METHODS: Lectures delivered with the help of visual materials, slides, videos. Laboratory exercises with the implementation of independent tasks, independent solution of applied course tasks.

METHOD OF TESTING AND EVALUATION: Exam. The final grade is formed by two components: - bearing 70% of the exam question and another 30%. - from the assessment received in defense of LE.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1.Димитров Д., Семерджиев А., Устройства за автоматичен контрол, Техника, София, 1979; 2. Активный контроль в машиностроении, под редакции Педь, Машиностроение, Москва, 1971 год.**;** 3. Балакшин О., автоматизация пневматического контроля размеров в машиностроении, Машгиз, Москва, 1974.

DESCRIPTION OF THE COURSE

Name of the course: **Mechanical and instrumental engineering for technological equipment**	Code: **BpME19.1**	Semester: **7**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 15 hours LW – 15 hours	Number of credits: **4**

LECTURER(S):
Assoc. Prof. Angel Lengerov, PhD , E-mail: anlen@tu-plovdiv.bg
Assist. Prof. Eng. Adelina Vasileva, PhD (MIE), tel.: 659 590, e-mail: adelina.bogoeva@abv.bg
Technical University of Sofia, branch Plovdiv

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

AIMS AND OBJECTIVES OF THE COURSE: The course on "Mechanical and instrumental engineering for technological equipment "aims to acquaint students with the basic requirements, prerequisites and design solutions for the construction of specialized equipment in various industries. Based on the desired processes to select and create adequate equipment. Knowledge of the main ongoing processes helps to create specialized equipment. The student acquires knowledge and skills on specific requirements and design solutions in the manufacture of machinery and apparatus in compliance with all important requirements of the standards in the field, necessary for the following disciplines in engineering training.

DESCRIPTION OF THE COURSE: The main topics concern: Basic processes and apparatus. Hydraulics. Hydrostatics. Hydrodynamic resistance in pipelines. Friction resistances. Resistances. Machines and apparatus for moving fluids. Piston pumps. Centrifugal pumps. Vortices. Rotary. Machines and apparatus for moving and shrinking gases. Compressors. Vacuum pumps. Fans. Hiders. Types of filter systems. Spinning machines and apparatus. Mass and heat exchange aparatus. Sorption processes and apparatus. Extraction apparatus. Drying. Distillation. Rectification.

PREREQUISITES Knowledge and methods are used in the discipline "Mathematics", "Physics", "Chemistry", "Engineering Graphics", on the basis of which methods are developed for solving problems in the field of applied processes and apparatus.

TEACHING METHODS: Lectures, assisted by drawings, slides, boards. Laboratory exercises. Course work developed on SolidWorks, which solves specific tasks in the field of technological equipment in instrument making.

METHOD OF ASSESSMENT: Current assessment of course work.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1 Сандалски Б., П. Горанов, Г. Динев, И. Николова Основи на конструирането и CAD, София, СОФТТРЕЙД, 2008; 2. Туджаров Б., Е. Тодорова, Д. Колева, М. Янчева "Ръководство за упражнения и курсова работа по Основи на конструирането и CAD I, София, СОФТТРЕЙД, 2008. 2. Доц. Кънчо Коларов. Хидромеханични процеси и апрати. (1977). ВХВП – Пловдив. 3. Доц. Кънчо Коларов. Масообменни процеси и апарати. (1977). ВХВП – Пловдив. 4. Албена Дуракова. Основни процеси и апарати в хранителната индустрия. (2015). УХТ – Пловдив. 5. Албена Дуракова. Сборник от задачи по основни процеси и апарати. (2016). УХТ – Пловдив. 6. Joël Bertrand, Georges Grevillot, Alain Storck. (1999). Génie des proceeds. TECHNIQUE & DOC. 7. Didier Ronze. (2013). Introduction au génie des procédés: applications et développements. Tec & Doc Lavoisier. 8. S. M. Henderson, Robert L. Perry, J. H. Young. (2021). Principles of Process Engineering 4th Edition. American Society of Agricultural Engineers. 9. Soares, C. (2002). Process engineering equipment handbook. New York: McGraw-Hill.

DESCRIPTION OF THE COURSE

Name of the course: **Automated production systems**	Code: **BpME21**	Semester: **8**
Type of teaching: Lectures(L) Laboratory work (LW)	Hours per semester: L – 15 hours LW – 10 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 "Mechanical Engineering and Instrumentation", professional field 5.1 Mechanical Engineering, field 5. Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is to acquaint students with the basics of building flexible production systems. The peculiarities of the technologies for flexible automated production are considered. 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: Basic concepts of automated systems, systems approach and systems analysis are considered. Students get acquainted with the degrees of automation of technological processes and the main indicators for evaluation of automated systems. The issues of productivity, reliability and their change in different ways of structural construction of automated systems are considered. Definitions, classifications, building elements, constructions and methods for design of automatic lines, automatic technological modules, flexible production systems are studied sequentially.

PREREQUISITES: Basic knowledge of "Mathematics", "Mechanics", "TMM", "Machine Elements", knowledge of "Mechanical Engineering Technology", "Quality Control", "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%).

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: **Computer integrated design in mechanical engineering**	Code: **BpME22.1**	Semester: 8
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 10 hours	Number of credits: 5

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: Compulsory elective 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 is to provide students with the foundation of modern CAE systems by giving knowledge in terms of hardware and software used - requirements, principles of construction, basic modules and connections. The aim of the course is also for students to have practical knowledge and skills in the use of applied products for design. During the training, students will get acquainted with the possibilities for engineering analysis, optimization and verification of accepted technical solutions in the environment of CAE system.

DESCRIPTION OF THE COURSE: Main topics: Applied design products in the field of industrial engineering. Capabilities of the basic configuration of CAE system. Linear static analysis-prerequisites. Apply constraints to the CAE system environment. Application of load in CAE system. Analysis with contact conditions. Generate a network of finite elements. Generating results in static tasks. Frequency analysis. Defining the properties of materials.

PREREQUISITES: Knowledge of fundamental and profiling technical disciplines is required, as well as knowledge and skills for working with CAD systems, acquired in "Engineering Graphics".

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: During the training two control tests are conducted, the assessment of the laboratory exercises is taken into account and a current assessment is formed.

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 машиностроенето, София, 2010; 7. Тенчев Р.Т. Метод на крайните елементи (Ръководство за работа с COSMOS/M) ТУ-София 1998г.

DESCRIPTION OF THE COURSE

Name of the course: **Structure and action of ammunition**	Code: **BpME22.2**	Semester: **8**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 10 hours	Number of credits: **5**

LECTURER(S):

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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 introduces students to the methods of Structure and action of ammunition.

DESCRIPTION OF THE COURSE: Main topics: design of ammunition elements.

PREREQUISITES: Theoretical mechanics, resistance of materials, physics, mathematics, thermodynamics, basics of heat transfer.

TEACHING METHODS: Lectures and laboratory work.

METHOD OF ASSESSMENT: Lectures and laboratory work

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: All available scientific literature sources forStructure and action of ammunition.

DESCRIPTION OF THE COURSE

Name of the course: **Computer modeling and simulations**	Code: **BpME22.3**	Semester: 8
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 10 hours	Number of credits: 5

LECTURER(S):

Assoc. Prof. Dr. Angel Stoilov Poparov, Eng., e-mail: poparan@abv.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 "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 in "Computer Modeling and Simulations" is to acquaint students with the nature, basic concepts, methodology, technology and methods of modeling and simulation.

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 the simulation modeling. The methods for engineering static and dynamic analysis, as well as the software products used for this purpose are also considered.

PREREQUISITES: Basic knowledge of modeling and simulation is required, as well as knowledge of "Engineering Graphics" and "Machine Elements".

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: Ongoing assessment

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: **Low-cost automation of discrete processes in precision engineering**	Code: **BpME23.1**	Semester: **8**
Type of teaching: Lectures(L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 10 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 "Mechanical Engineering and Instrumentation", professional field 5.1 Mechanical Engineering, field 5. Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is to acquaint students with the methods, technical means for automation and robotization of production processes of a discrete nature in precision manufacturing and low-cost automation systems (LNA) based on them. A unified approach and methodology is used in the automation of various technological operations, based on mass-produced modular elements and units.

DESCRIPTION OF THE COURSE: Main topics: General characteristics of low cost automation systems. Basic properties of technical systems for low-cost automation and their description. Process of design preparation in the production of low cost automation systems. Methods of synthesis. Decision making methods. Manipulation functions in low-cost automation of discrete processes of precision engineering. Types of drives of manipulation systems. Elements for pneumatic systems. Profile rail guides. Linear pneumatic drives. Rotary drives. Electric drives. Catchers. Sensors of pneumatic drives.

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: The lectures are conducted with the use of an overhead projector, a multimedia projector and other technical means, through which the structure of the lecture, some definitions and the most essential knowledge, quantities, drawings, dependencies, graphs and formulas are projected on the screen. During the laboratory exercises, students perform tasks under the guidance of the lecturer. The lectures are conducted with the use of an overhead projector, a multimedia projector and other technical means, through which the structure of the lecture, some definitions and the most essential knowledge, quantities, drawings, dependencies, graphs and formulas are projected on the screen. During the laboratory exercises, students perform tasks under the guidance of 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.Краузе В., Конструирование приборов, М., Машиностроене, 1987; 2. Малаков И., Нискостойностна автоматизация на дискретното производство, ТУ, С., 2009г.; 3. Чакърски Д., Шопов И., Автоматизиращи устройства, ТУ София, 2008г,; 4. Орлов П., Основьи конструирования, М, Машиностроене, 1988г.; 4. Чакърски Д. И к-в. Промишлени роботи и роботизирани технологични модули и системи. Част 1 и част2. ИК на ТУ-София, 2003г.; 5. 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 of elements for small arms (ammunition)**	Code: **BpME23.2**	Semester: **8**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 10 hours	Number of credits: **5**

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 introduces students to methods and equipment for the production of elements for small arms (ammunition).

DESCRIPTION OF THE COURSE: Main topics: methods and equipment for the production of elements for small arms (ammunition).

PREREQUISITES: Theoretical mechanics, resistance of materials, physics, mathematics, thermodynamics, basics of heat transfer, materials science.

TEACHING METHODS: Lectures and laboratory work.

METHOD OF ASSESSMENT: Lectures and laboratory work

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: All available scientific literature sources for the production of elements for small arms (ammunition).

DESCRIPTION OF THE COURSE

Name of the course: **Reliability and diagnostics of devices and machines**	Code: **BpME23.3**	Semester: 8
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 10 hours	Number of credits: 5

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

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: **Safety and eco-protection technology**	Code: **BpME24**	Semester: 8
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 20 hours LW – 10 hours	Number of credits: **3**

LECTURER(S):

Assoc. Prof. Eng. Stanimir Stefanov, PhD (FEA), e-mail: glasst@tu-plovdiv.bg
Assoc. Prof. Eng. Marin Genchev, PhD (FEA), e-mail: marin2g@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 Mechanical and Instrument Engineering, Professional orientation 5.1 Mechanical Engineering, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The course has to provide students with basic knowledge of labor safety and environment protection. In the "Ecology" section, students are introduced to issues related to environmental pollution, basic concepts and categories in ecology and the state of nature.

DESCRIPTION OF THE COURSE: Students get introduced to the legislation, the status of the manufacture traumatism, labor safety and environment protection. It treats the conditions of labor in the field of manufacture with the purpose to reduce any manufacture and ecological risks.

PREREQUISITES: The course of lectures and seminars is based on knowledge students have acquired in Physics and Electrical Engineering.

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: Lectures. Laboratory exercises performed under laboratory guidance with protocols developed by students and defended in class before the teacher.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Генчев М. Кирчев В. , Техническа безопасност и екозащита, ISBN 978-954-2937-08-1 , ТУ София, филиал Пловдив, 2011; 2.Вълчев М, Иванов И. Охрана на труда и околната среда. С. Техника, 1984; 3. Вълчев М. Охрана на труда. С. Техника 1990; 4. Анев Т. и колектив. Вредни въздействия на електричеството и защита от тях С. Техника, 1987; 5. Наредба № РД-07-2 от 16 декември 2009 г. за условията и реда за провеждането на периодично обучение и инструктаж на работниците и служителите по правилата за осигуряване на здравословни и безопасни условия на труд, МТСП, Обн. ДВ. бр. 102 от 22.12.2009 г., попр. ДВ. бр. 4 от 15.01.2010 г., изм. ДВ. бр. 25 от 30.03.2010 г.; 6. Правилник за безопасност и здраве при работа в електрически уредби на електрически и топлофикационни централи и по електрически мрежи, МЕЕР, Обн. ДВ. бр. 34 от 27.10.2004 г., изм. ДВ. бр. 19 от 01.03.2005 г., изм. и доп. ДВ. бр. 92 от 22.10.2013 г.