

## DESCRIPTION OF THE COURSE

Name of the course: <b>Mathematics 4</b>	Code: <b>BpIEe38</b>	Semester: 5
Type of teaching: Lectures (L) Seminars (S)	Hours per semester: L – 22 hours S – 16 hours	Number of credits: 4

### **LECTURER(S):**

Assoc. Prof. Vasil Petrov, PhD ( FME) , tel.: 32 659 677, mail: [vasil\\_petrov@tu-plovdiv.bg](mailto:vasil_petrov@tu-plovdiv.bg) ,  
Technical University of Sofia-Branch Plovdiv  
Technical University of Sofia

**COURSE STATUS IN THE CURRICULUM:** Compulsory subject from the curricula for training of students to obtain Bachelor's degree, specialty “Industrial Engineering”, 5.13 General engineering, Field 5 Technical Sciences.

**AIMS AND OBJECTIVES OF THE COURSE:** To get basic skills in probability theory. To apply this theory for building statistical models and to estimate parameters of these models as well as their statistical significance.

**DESCRIPTION OF THE COURSE:** Main topics. *Probability theory:* sample space, events, probability of an event; conditional probability; independent events, Bayes theorem, Bernoulli trials; Random variables, mean and variance, Binomial and Poisson distributions; Normal distribution, normal approximation to binomial distribution. *Statistics:* population and samples, measures of location and spread; estimators – point estimators and confidence intervals; chi-squared test; hypotheses testing; linear regression

**PREREQUISITES:** Mathematics I (BIEe01), Mathematics 2 (BIEe10), Mathematics 3 (BIEe20)

**TEACHING METHODS:** Lectures and Seminars.

**METHOD OF ASSESSMENT:** Written exam.

**INSTRUCTION LANGUAGE:** English

### **BIBLIOGRAPHY:**

1. William Mendenhall, Terry Sincich, Statistics for Engineering and the Sciences, CRC Press, Taylor & Francis Group, 6<sup>th</sup> ed., 2019
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10<sup>th</sup> ed., 2018 .
3. Joseph K. Blitzstein, Jessica Hwang, Introduction to probability, CRC Press, Taylor & Francis Group, 2015..

## DESCRIPTION OF THE COURSE

Name of the course: <b>Control Theory II</b>	Code: <b>BpIEe39</b>	Semester: 5
Type of teaching: Lectures(L) Laboratory work (LW)/Seminars (S) Course work (CW)	Hours per semester: L – 15hours S– 18 hours LW – 15 hours	Number of credits: 5
Course project (CP)		

**LECTURER(S):**

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**COURSE STATUS IN THE CURRICULUM:** Compulsory subject from the curriculum for training of students to obtain Bachelor's degree, specialty Industrial Engineering, Professional orientation 5.13 General Engineering, Field 5 Technical Sciences.

**AIMS AND OBJECTIVES OF THE COURSE:** To provide knowledge on the approaches for analysis and synthesis of control systems based on state space models. To introduce the description of the system in state space and their basic features (stability, controllability, observability) as well as synthesis with given poles and under quadratic criterion for quality. To provide skills for simulation of control systems and for solving analysis and synthesis tasks with MATLAB and SIMULINK. . Description in state space. Controllability and observability. Stability of linear systems and method of Lyapunov. Synthesis with given poles. State observers. Synthesis of optimal linear systems under quadratic criterion for quality. Introduction into the software package for analysis and synthesis of control systems – MATLAB and SIMULINK. |

**DESCRIPTION OF THE COURSE:** The main topics concern:.

**PREREQUISITES:** Control Theory I, Mathematics, Physics, Mechanics, Electrical Engineering, Informatics.

**TEACHING METHODS:** Lectures, using slides, laboratory work with protocols and defence, seminars.

**METHOD OF ASSESSMENT:** One (two-hours) exam at the end of the semester (80%), protocols of the laboratories (20%).

**INSTRUCTION LANGUAGE:** English

**BIBLIOGRAPHY:** 1. Kuo B. C. F. Golnaraghi, Automatic Control Systems, 9-th ed., John Wiley & sons, N.Y., 2009; 2. Nise, N., Control Systems Engineering, 7-th ed., John Wiley & sons, 2015; 3. Dorf R. C., R. Bishop, Modern Control Systems. 12-th ed. Prentice Hall, 2010; 4. Antsaklis, P., A. Michel, A Linear Systems Primer, Birkhauser, 2007; 5. Gatev G., K. Perv, Control Theory. Laboratory Manual, Technical University - Sofia, 2006.

## DESCRIPTION OF THE COURSE

Name of the course: <b>Materials Technology</b>	Code: <b>BpIEe40</b>	Semester: <b>5</b>
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 26 hours LW – 15 hours	Number of credits: <b>4</b>

### **LECTURER(S):**

Assoc. Prof. Eng. Georgi Levicharov, PhD (FME), tel.: 659 624, e-mail: [glevi@tu-plovdiv.bg](mailto:glevi@tu-plovdiv.bg)

Assist. Prof. Eng. Konstantin Chukalov, PhD (FME), tel.: 659 617, e-mail: [chukalov@tu-plovdiv.bg](mailto:chukalov@tu-plovdiv.bg)

Technical University of Sofia

**COURSE STATUS IN THE CURRICULUM:** Compulsory facultative subject from the curriculum for training of students to obtain Bachelor's degree, specialty Industrial Engineering, Professional orientation 5.13 General Engineering, Field 5 Technical Sciences.

**AIMS AND OBJECTIVES OF THE COURSE:** At the end of the course the students should receive basic knowledge of the properties of materials and methods for their processing; to provide a base of knowledge about technological processes necessary for the design, manufacture and testing of blanks, parts and machines.

**DESCRIPTION OF THE COURSE:** The main topics concern: Casting; Molding materials; Molding; Casting of cast iron, steel and Al-alloys; Casting in metal and shell molds, with fusible models, under pressure; Preparation of amorphous alloys and semi-finished products; Guidelines for the construction of castings; Processing by plastic deformation; Rolling; Pressing; Open-die forging; Stamping; Welding, Hardfacing, Brazing, Gluing; Electric arc welding; Welded joints and seams; Electron beam and laser processing; Electric resistance welding; Thermal cutting; Powder metallurgy; Preparation of plastic products; Preparation of products from composite materials with a polymer, metal and ceramic matrix..

**PREREQUISITES:** Physics I and II, Chemistry, Materials Science.

**TEACHING METHODS:** Lectures, using slides, laboratory work with protocols.

**METHOD OF ASSESSMENT:** Written examination at end of semester (80%), laboratories (20%).

**INSTRUCTION LANGUAGE:** English

**BIBLIOGRAPHY:** 1. Желев, Ал. Материалознание. Техника и технология. Том 1: Получаване на машиностроителните материали, С., 1999. Том 2: Технологични процеси и обработваемост. 2. Калев Л. Технология на машиностроителните материали, С., 1987. 3. Тодоров Р. Металокерамични конструкционни изделия, С., Техника, 1982. 4. Тодоров Р. Металокерамични конструкционни изделия, С., Техника, 1982. 5. Пинчук Л. С. и др. Материаловедение, М., 1988 г. 7. Желев Ал. И др. Композиционни материали, С., 1998. 8. Шатт, В. Порошковая металлургия. Спеченные композиционные материалы. М., Металлургия, 1984. 10. Dilthey, U. Fügen zukunftsweisender Werkstoffe, Aachen, 1999. 11. Fritz, H., Schulze, G. Fertigungstechnik, Berlin, Springer Verlag, 2001. 12. Krause, W. Fertigung in der Feinwerk- und Mikrotechnik, Carl Hanser Verlag, München, 1995. 13. Callister, W. Fundamentals of Materials Science and Engineering, John Wiley and Sons, 2005. 14. Weißbach, W. Werkstoffkunde und Werkstoffprüfung, Braunschweig, Vieweg Verlag, 1994. Kalpakjian S. Manufacturing processes for engineering materials, Addison-Wesley, 1991.

## DESCRIPTION OF THE COURSE

Name of the course: <b>Systems Modelling and Simulation</b>	Code: <b>BpIEe41</b>	Semester: <b>5</b>
Type of teaching: Lectures(L) Laboratory work (LW) Course work (CW)	Hours per semester: L – 22 hours LW – 15 hours	Number of credits: <b>4</b>

### **LECTURER(S):**

Assoc. Prof. Eng. Hristian Panayotov, PhD (FME), tel.:032659518, e-mail:[hristian@tu-plovdiv.bg](mailto:hristian@tu-plovdiv.bg)  
Technical University of Sofia

**COURSE STATUS IN THE CURRICULUM:** Compulsory from the curricula for training of students to obtain Bachelor's degree, specialty Industrial Engineering, Professional orientation 5.13 General Engineering, Field 5 Technical Sciences.

**AIMS AND OBJECTIVES OF THE COURSE:** To provide the bachelor degree students with basic knowledge and practical skills of Computer-aided Design (CAD) systems. The course gives knowledge about principles of creating 3D models and their application in engineering documentation and other engineering activities in virtual environment.

**DESCRIPTION OF THE COURSE:** The main topics concern: General review of CAD systems applications, design software and main features, types of geometric models, creating and applications, feature based parametric models – basic features, plane sketches – constrains and dimensioning, degrees of freedom, 3D features, types, creating and interaction, assemblies – 3D constrains and degrees of freedom. Basics of computer-aided engineering analysis.

**PREREQUISITES:** Mathematics, Informatics, Applied Geometry and Engineering Graphics, Resistance of the Materials.

**TEACHING METHODS:** Lectures, using slides, case studies, and computer generated presentations, laboratory exercises based on actual design and problems solving with CAD applications.

**METHOD OF ASSESSMENT:** Constant knowledge monitoring by tests, laboratory exercises and course work. Two test during the semester: theoretical (weight coefficient 0.33), practical (weight coefficient 0.33) and a course work (weight coefficient 0.33).

**INSTRUCTION LANGUAGE:** English

**BIBLIOGRAPHY:** 1. Farid M. Amirouche , Principles of Computer Aided Design and Manufacturing (2nd Edition), Prentice Hall; 2 edition (January 22, 2004), ISBN-13:978-0130646316, 510 p. 2. Anupam Saxena , Birendra Sahay, Computer Aided Engineering Design, Springer; Softcover reprint of hardcover 1st ed. 2005 edition (November 23,2010), ISBN-10: 9048166799, ISBN-13: 978-9048166794, 426 p.3. SolidWorks Tutorials, <https://www.solidworks.com/sw/resources/solidworks-tutorials.htm>.

## DESCRIPTION OF THE COURSE

Name of the course: <b>Industrial Manufacturing Systems I</b>	Code: <b>BpIEe42</b>	Semester: 5
Type of teaching: Lectures (L) Seminars (S) Course work (CW)	Hours per semester: L – 22 hours S – 18 hours	Number of credits: 4

### **LECTURER(S):**

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Technical University of Sofia

**COURSE STATUS IN THE CURRICULUM:** Compulsory subject from the curriculum / curricula for training of students to obtain Bachelor's degree, specialty Industrial Engineering, Professional orientation 5.13 General 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 theoretical knowledge and practical skills, necessary for the understanding and implementation of contemporary manufacturing processes and the setting up of manufacturing systems. A course work is also included in the study with the aim to make the students use the theoretical knowledge for developing concrete technological and design solutions.

**DESCRIPTION OF THE COURSE:** The main topics concern: Metal cutting. Turning and related operations. Drilling. Milling. Abrasive Machining processes. Broaching. Gear manufacturing.. Special machining processes. Numerical control. Production operations. Assembly operations, Production economics.

**PREREQUISITES:** Introduction to Manufacturing and Industrial Practice, Material Science, Strength of Materials.

**TEACHING METHODS:** Lectures, using slides, case studies, seminars and course work description preparation and defence.

**METHOD OF ASSESSMENT:** Two one-hour assessments at mid and end of semester (70%), course work - three off assignments (30%).

**INSTRUCTION LANGUAGE:** English

**BIBLIOGRAPHY:** 1. Groover M. P. Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 4th Edition, Wiley and Sons 2010, ISBN 978-0470-467002; 2. Kalpakjan, S., St. Schmid, C. Kok, Manufacturing, Engineering and Technology, 6th Edition, Prentice Hall 2009. ISBN-10: 9810681445 . 3. Groover, M. Automation, Production Systems and CIM. Prentice Hall 2001. ISBN 9780130895462. .

## DESCRIPTION OF THE COURSE

Name of the course: <b>Production Operation Management I</b>	Code: <b>BpIEe43</b>	Semester: 5
Type of teaching: Lectures (L) Seminars (S)	Hours per semester: L –22 hours S – 18 hours	Number of credits: 4

### **LECTURER(S):**

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Technical University of Sofia

**COURSE STATUS IN THE CURRICULUM:** Compulsory subject from the curriculum for training of students to obtain Bachelor's degree, speciality Industrial Engineering, Professional orientation 5.13 General Engineering.

**AIMS AND OBJECTIVES OF THE COURSE:** Upon completion of the course students must acquire knowledge and skills for the main problem areas and tasks of production and operations management, to have initial knowledge of the basic approaches and methods in the science of production systems management.

**DESCRIPTION OF THE COURSE:** The scope of the course includes the basic principles and functions in management. A detailed introduction is made in production and operational management by presenting their basic concepts. The historical evolution in the production management is traced. The concept of production is studied and the types of production systems are considered in detail. The construction and creation of a product with the analysis of the important management decisions that must be made in this process are considered. Attention is paid to the phases that the product development goes through, as well as to the methods by which this process can be improved. The principles applicable in the development of a strategy for process management in the organization are affected, as well as the decisions that must be made in this process. The various strategies in organizing the process of customer service in production and in the field of services are considered. The philosophies for process management are presented with an emphasis on process reengineering and process improvement. The systematic approach in analyzing the processes, the techniques for documenting and evaluating the processes, as well as the tools for solving a problem are studied. Attention is paid to capacity planning, its measurement and the tools used. Strategies for long-term and short-term capacity planning are presented.

**PREREQUISITES:** Introduction to manufacturing and industrial practice, Industrial management, Economics.

**TEACHING METHODS:** Lectures using presentations, discussions with the active participation of students after preliminary preparation. Seminar exercises - studying the theoretical part of a topic from the curriculum and solving problems on the respective topic.

**METHOD OF ASSESSMENT:** The method of assessment is controlled by current assessment, which is formed by two components: a test with a weighting factor of 0.60 and an assessment of the seminars with a weighting factor of 0.40

**INSTRUCTION LANGUAGE:** English

### **BIBLIOGRAPHY:**

1. Ellen F. Monk and Bret J. Wagner, Concepts in Enterprise Resource Planning, Fourth Edition, 2013 Course Technology, Cengage Learning

2. K.E. Kurbel, Enterprise Resource Planning and Supply Chain Management, Progress in IS, DOI 10.1007/978-3-642-31573-2\_2, Springer-Verlag Berlin Heidelberg 2013
3. J. C. Lang, Production and Inventory Management with Substitutions, Lecture Notes in Economics and Mathematical Systems 636, DOI 10.1007/978-3-642-04247-8\_2, Springer-Verlag Berlin Heidelberg 2010
4. MstNazma Sultana, Shohanuzzaman Shohan, Fardim Sufian, AGGREGATE PLANNING USING TRANSPORTATION METHOD: A CASE STUDY IN CABLE INDUSTRY, International Journal of Managing Value and Supply Chains (IJMVSC) Vol.5, No. 3, September 2014
5. Mahmoud Abbas Mahmoud Al-Naimi, MATERIAL AND CAPACITY REQUIREMENTS PLANNING (MRP AND CRP), Industrial Engineering Branch, Department of Production Engineering and Metallurgy, University of Technology, Baghdad – Iraq, 2015-2016
6. Mahmoud Abbas Mahmoud Al-Naimi, AGGREGATE PLANNING AND MASTER SCHEDULING, Industrial Engineering Branch, Department of Production Engineering and Metallurgy, University of Technology, Baghdad – Iraq, 2015-2016
7. Dawei Lu, Fundamentals of Supply Chain Management, Ventus Publishing ApS, 2011
8. Sunil Chopra, Peter Meindl, Supply Chain Management: STRATEGY, PLANNING, AND OPERATION, Fifth Edition, Pearson Education, Inc., publishing as Prentice Hall, 2013
9. Sushil Gupta and Martin Starr, Production and Operations Management Systems, 2014 by Taylor & Francis Group, LLC
10. LEE J. KRAJEWSKI, LARRY P. RITZMAN, MANOJ K. MALHOTRA, Operations Management: PROCESSES AND SUPPLY CHAINS, TENTH EDITION, Pearson Education Limited 2013
11. Navleen Kaur, Richa Khunteta, Principles and Practices of Management, Published by : Think Tanks Biyani Group of Colleges, 2012
12. Supply Chain Management, Edited by Pengzhong Li, Published by InTech, 2011
13. Supply Chain Management, Copyright 2016 by Tutorials Point (I) Pvt. Ltd.
14. Yacob Khojasteh, Production Management Advanced Models, Tools, and Applications for Pull Systems, ISBN 9781138032217, Published November 14, 2017 by Productivity Press
15. Dan Olsen, The Lean Product Playbook: How to Innovate with Minimum Viable Products and Rapid Customer Feedback, Wiley, 2015
16. Pascal Dennis, Lean Production Simplified, 3rd Edition, Published October 23, 2015 by Productivity Press
17. F. Robert Jacobs and Richard Chase, Operations and Supply Chain Management, 15th Edition, McGraw Hill, 2017

## DESCRIPTION OF THE COURSE

Name of the course: <b>Measurements Systems</b>	Code: <b>BpIEe44</b>	Semester: 5
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S) Course work (CW)	Hours per semester: L – 26 hours S – 30 hours LW – 0 hours	Number of credits: 4

### **LECTURER(S):**

Assoc.Prof. Eng. Margarita Deneva, PhD (FEA), tel.: 659 759, e-mail: [deneva@tu-plovdiv.bg](mailto:deneva@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 Industrial Engineering, Professional orientation 5.13 General Engineering, Field 5 Technical Sciences.

**AIMS AND OBJECTIVES OF THE COURSE:** The course provides knowledge in principles and realization of the measurement systems, the application of various techniques for measurements, as well as the improvement of the measurement systems (their metrological characteristics). The students will also obtain knowledge of basic mechanical, electronic and optical instruments and their application in the engineering metrology. At the end of the course the student will: use the basic terms in the measurement systems, use important practical approaches with actual measurement systems for various quantities; will define basic concepts, quantities, indicators and dependences in the theory of errors and will model them; will compare the accuracy and the safety for various technical realizations in the measurement systems; will be able to solve tasks on metrological security of the production.

**DESCRIPTION OF THE COURSE:** The course is divided at two major parts. **The first one** is constructed from 4 modules. The general topics are: Measuring systems – design and structure, static characteristics and generalized model of the system's elements, dynamic characteristics and dynamic errors, processing results from repetitive measurements, accuracy of measurement systems in stationary mode, opportunities to reduce errors, load effect in measurement systems, signals and noise, methods for decreasing the errors due to the noise and ambient factors, signal conditioning elements. **The second part** of the course concerns specialized measurement systems for precise measurements of geometrical quantities, measurements in mechanics – forces and intensity of sound field, measurements in optics – energetic and spectral characteristics of optical fields, introduction to applied measurements in radioactivity.

**PREREQUISITES:** Physics, Mathematics, Electronics, Electrical Engineering

**TEACHING METHODS:** Lectures, using multimedia materials, case studies, laboratory exercises, work in teams, protocols preparation and defence.

**METHOD OF ASSESSMENT:** Exam - two hours (80%); defence of laboratory protocols (20%).

**INSTRUCTION LANGUAGE:** English

**BIBLIOGRAPHY:** John Bentley. Principles of Measurement systems, Longman, Scientific @ Technical. 1992; Doebelin E.O. Measurement Systems, Application and Design, 4<sup>th</sup> ed., McGraw-Hill Pub. Company, 1990; Galyer J. F.W., C. R. Shotbolt, Metrology for Engineers., Cassel Pub. Limited, London, 1990; Anthony D. M. Engineering metrology. Pergamon Press, Oxford, 1992; М. Денева, М. Ненчев, „Лазерното лъчение в представяне за инженери и приложници”, „Интелексперт'94”, Plovdiv 2013



## DESCRIPTION OF THE COURSE

Name of the course: <b>Industrial Manufacturing Systems II</b>	Code: <b>BpIEe46</b>	Semester: 6
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S)	Hours per semester: L – 22 hours S – 15 hours LW – 15 hours	Number of credits: <b>5</b>

### **LECTURER(S):**

Assoc. Prof. Eng Iliya Chetrokov, (FME), tel.: 659 616, e-mail: [chetrokov@tu-plovdiv.bg](mailto:chetrokov@tu-plovdiv.bg)  
Technical University of Sofia

**COURSE STATUS IN THE CURRICULUM:** Compulsory subject from the curriculum / curricula for training of students to obtain Bachelor's degree, specialty Industrial Engineering, Professional orientation 5.13 General 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 theoretical knowledge and practical skills, necessary for the understanding and implementation of contemporary industrial manufacturing systems. Special attention is paid to the including of the latest achievements of production automation for manufacturing, the different subsystems and elements of production systems, the machine tools, the production lines. The course material is illustrated with examples of the different elements of production systems.

**DESCRIPTION OF THE COURSE:** The main topics concern: Introduction to the manufacturing system, Manufacturing industries and products, Components of a manufacturing system, Classification of manufacturing systems, Basic elements and mechanisms of machine tools, Machine tool structures, Machine tool drives, Automation technologies for manufacturing systems, Levels of automation, Production lines, Automated and manual production lines, Flexible manufacturing systems (FMS), Mechanical aspects about robots-manipulators.

**PREREQUISITES:** Introduction to Manufacturing and Workshop Practice, Industrial Manufacturing Systems – I.

**TEACHING METHODS:** Lectures, using slides, case studies, seminars and laboratory work.

**METHOD OF ASSESSMENT:** Exam at the end of semester (80%), tutorial work (20%).

**INSTRUCTION LANGUAGE:** English

**BIBLIOGRAPHY:** 1. Groover M. P. Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 4th Edition, Wiley and Sons 2010, ISBN 978-0470-467002; 2. Kalpakjan, S., St. Schmid, C. Kok, Manufacturing, Engineering and Technology, 6th Edition, Prentice Hall 2009. ISBN-10: 9810681445 . 3. Groover, M. Automation, Production Systems and CIM. Prentice Hall 2001. ISBN 9780130895462. 4. Groover, M., E. Zimmers, CAD/CAM Computer Aided Design and Manufacturing, Prentice Hall, 1984, ISBN-9780132440813.

## DESCRIPTION OF THE COURSE

Name of the course: <b>Thermodynamics and Heat Transfer</b>	Code: <b>BpIEe47</b>	Semester: <b>6</b>
Type of teaching: Lectures (L) Laboratory work (LW)/Seminar (S) Course work (CW)	Hours per semester: L – 22 hours S – 15 hours LW – 15 hours	Number of credits: <b>5</b>

### LECTURERS:

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Technical University of Sofia, Plovdiv Branch

**COURSE STATUS IN THE CURRICULUM:** Compulsory course from the curricula for training of students for Bachelor's degree, specialty "Industrial engineering (in English)", professional field 5.13 General Engineering, field 5. Technical Sciences.

**AIMS AND OBJECTIVES OF THE COURSE:** After completing the course, the students must know the basic concepts, equations and dependencies in thermodynamics, as well as be able to apply the basic principles in their study and in their practical use. In addition, students must know the physical basis of heat distribution through thermal conductivity, convection and radiation in their joint action, as well as apply engineering methods for calculating different types of heat transfer.

**DESCRIPTION OF THE COURSE:** Main topics:

1. Thermodynamic parameters of the state; Basic laws of ideal gases; Basic thermodynamic processes; First and Second Laws of Thermodynamics; Real gases, steam processes; Theoretical cycles of internal combustion engines.
2. Thermal conductivity; Convective heat transfer; Radiant heat transfer; Heat transfer; Heat exchangers.

**PREREQUISITES:** Prior knowledge of mathematics, physics and fluid mechanics is required.

**TEACHING METHODS:** Lectures using slides and demo programs, seminar exercises and laboratory exercises with protocols.

**METHOD OF ASSESSMENT:** Written exam.

**INSTRUCTION LANGUAGE:** English

### **BIBLIOGRAPHY:**

1. A. Georgiev. Thermodynamics and heat transfer (Manual for laboratory exercises), Imeon Publishing House, Plovdiv, ISBN 978-954-9449-53-2, 2012, 50 pages.

2. A. Georgiev. Thermodynamics and heat transfer (Textbook), Imeon Publishing House, Plovdiv, ISBN 978-954-9449-67-9, 2013, 200 pages.

## DESCRIPTION OF THE COURSE

Name of the course: <b>Technical safety</b>	Code: <b>BpIEe48</b>	Semester: 6
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S) Course work (CW)	Hours per semester: L – 16 hours S – 15 hours LW – 0 hours	Number of credits: 3

### **LECTURER(S):**

Assoc.Prof. Eng. Margarita Deneva, PhD (FEA), tel.: 659 759, e-mail: [deneva@tu-plovdiv.bg](mailto:deneva@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 Industrial Engineering, Professional orientation 5.13 General Engineering, Field 5 Technical Sciences.

**AIMS AND OBJECTIVES OF THE COURSE:** Acquiring knowledge on basic requirements, methods and means of ensuring the safety of labor under modern technological processes in the industry. At the end of the course the students will know the conceptual apparatus of technical safety; basic safety requirements under different working conditions and basic methods and means to ensure occupational safety..

**DESCRIPTION OF THE COURSE:** The main topics include: microclimate and air condition in the workplace. Ergonomics. Classification of working places and technical devices in terms of electrical and fire hazard and the risk of explosion. Electrical safety in normal mode and fault electrical devices and equipment. Assessing the risk of electrical shock at direct contact with live parts in single-phase and two-phase networks. Effects and processes related to the flow of electric current into the ground. Risk of electric shock - contact and foot voltage. Technical measures to protect people from injury at a short circuit. Electrical Protection from direct contact. Technical measures for protection against indirect contact. Electromagnetic fields (EMF) with different frequency. Lightning protection of buildings and facilities. Noise and vibration in the workplace. Laser safety.

**PREREQUISITES:** Electrical Engineering, Electronics, Computing, Physics..

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

**METHOD OF ASSESSMENT:** Final semester mark, based on three components: major final test at the end of the semester and a transitional control test in the middle of the semester for what has been learned so far with weights 0.6 and 0.3 and evaluation of laboratory work with weight 0.1.

**INSTRUCTION LANGUAGE:** English

**BIBLIOGRAPHY:** M. Deneva, Lecture notes on “Technical Safety”, 2021; М. Денева, М. Ненчев, “Лазерното лъчение в представяне за инженери и приложници”, изд. Интелексперт-94, ISBN 978-954-8835-76-3, (2013); Assoc. prof. PhD Marinela Yordanova, “Technical safety” Textbook (Lectures), Technical University of Varna (2009)

## DESCRIPTION OF THE COURSE

Name of the course: <b>Production Operation Management II</b>	Code: <b>BpIEe49</b>	Semester: 6
Type of teaching: Lectures (L) Seminars (S)	Hours per semester: L – 22 hours S – 15 hours	Number of credits: 4

### **LECTURER(S):**

Assist. Prof. Elena Zlatanova-Pazheva, PhD (FME), tel.: 032 659 712,  
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Technical University of Sofia

**COURSE STATUS IN THE CURRICULUM:** Compulsory subject from the curriculum for training of students to obtain Bachelor's degree, speciality Industrial Engineering, Professional orientation 5.13 General Engineering.

**AIMS AND OBJECTIVES OF THE COURSE:** After completing the course, students must deepen their knowledge and skills about the problems in the field of production and operational management, to build skills for their analysis and on this basis to be able to make decisions.

**DESCRIPTION OF THE COURSE:** The scope of the course includes the following main topics: Plant location and layout. Location of production buildings and production facilities in different situations relevant to the choice of location. Factors influencing the choice of location, location models, organization of physical facilities - conditions and requirements. Materials management - functions, materials planning techniques, supplier selection, inventory management. Lean production - the essence, the history of the evolution of the concept. Principles behind the Toyota Production System (TPS). Stages of Lean production process, waste reduction tools, the Six Sigma concept and its integration with Lean. Production planning and control - goals, phases, functions, parameters. Aggregate planning - the nature and problem that solves aggregate planning strategies. Development of production program, planning of material resources, product structure - essence and different ways of presentation, Enterprise resource planning of the organization - evolution of ERP systems, characteristics, functional areas of ERP, benefits, business modules. Material handling - goals, principles, necessary equipment. Quality control - factors affecting quality, nature and types of inspection, inspection methods, types of quality control, tools, total quality management. Supply chain management.

**PREREQUISITES:** Production Operation Management I, Introduction to manufacturing and industrial practice, Industrial management, Economics.

**TEACHING METHODS:** Lectures using presentations, discussions with the active participation of students after preliminary preparation. Seminar exercises - studying the theoretical part of a topic from the curriculum and solving problems on the respective topic.

**METHOD OF ASSESSMENT:** The method of assessment is controlled by exam. The assessment is formed by two components: an exam test with a weighting factor of 0.60 and an assessment of the seminars with a weighting factor of 0.40

**INSTRUCTION LANGUAGE:** English

### **BIBLIOGRAPHY:**

1. Ellen F. Monk and Bret J. Wagner, Concepts in Enterprise Resource Planning, Fourth Edition, 2013 Course Technology, Cengage Learning
2. K.E. Kurbel, Enterprise Resource Planning and Supply Chain Management, Progress in IS, DOI 10.1007/978-3-642-31573-2\_2, Springer-Verlag Berlin Heidelberg 2013

3. J. C. Lang, Production and Inventory Management with Substitutions, Lecture Notes in Economics and Mathematical Systems 636, DOI 10.1007/978-3-642-04247-8\_2, Springer-Verlag Berlin Heidelberg 2010
4. MstNazma Sultana, Shohanuzzaman Shohan, Fardim Sufian, AGGREGATE PLANNING USING TRANSPORTATION METHOD: A CASE STUDY IN CABLE INDUSTRY, International Journal of Managing Value and Supply Chains (IJMVSC) Vol.5, No. 3, September 2014
5. Mahmoud Abbas Mahmoud Al-Naimi, MATERIAL AND CAPACITY REQUIREMENTS PLANNING (MRP AND CRP), Industrial Engineering Branch, Department of Production Engineering and Metallurgy, University of Technology, Baghdad – Iraq, 2015-2016
6. Mahmoud Abbas Mahmoud Al-Naimi, AGGREGATE PLANNING AND MASTER SCHEDULING, Industrial Engineering Branch, Department of Production Engineering and Metallurgy, University of Technology, Baghdad – Iraq, 2015-2016
7. Dawei Lu, Fundamentals of Supply Chain Management, Ventus Publishing ApS, 2011
8. Sunil Chopra, Peter Meindl, Supply Chain Management: STRATEGY, PLANNING, AND OPERATION, Fifth Edition, Pearson Education, Inc., publishing as Prentice Hal, 2013
9. Sushil Gupta and Martin Starr, Production and Operations Management Systems, 2014 by Taylor & Francis Group, LLC
10. LEE J. KRAJEWSKI, LARRY P. RITZMAN, MANOJ K. MALHOTRA, Operations Management: PROCESSES AND SUPPLY CHAINS, TENTH EDITION, Pearson Education Limited 2013
11. Navleen Kaur, Richa Khunteta, Principles and Practices of Management, Published by : Think Tanks Biyani Group of Colleges, 2012
12. Supply Chain Management, Edited by Pengzhong Li, Published by InTech, 2011
13. Supply Chain Management, Copyright 2016 by Tutorials Point (I) Pvt. Ltd.
14. Yacob Khojasteh, Production Management Advanced Models, Tools, and Applications for Pull Systems, ISBN 9781138032217, Published November 14, 2017 by Productivity Press
15. Dan Olsen, The Lean Product Playbook: How to Innovate with Minimum Viable Products and Rapid Customer Feedback, Wiley, 2015
16. Pascal Dennis, Lean Production Simplified, 3rd Edition, Published October 23, 2015 by Productivity Pres
17. F. Robert Jacobs and Richard Chase, Operations and Supply Chain Management, 15th Edition, McGraw Hill, 2017.

## DESCRIPTION OF THE COURSE

Name of the course: <b>Manufacturing Design I</b>	Code: <b>BpIEe50</b>	Semester: 6
Type of teaching: Lectures (L) Laboratory work (LW) Course project (CP)	Hours per semester: L – 22 hours LW – 30 hours	Number of credits: <b>4</b>

### **LECTURER(S):**

Assoc. Prof. Eng Iliya Chetrokov, (FME), tel.: 659 616, e-mail: [chetrokov@tu-plovdiv.bg](mailto:chetrokov@tu-plovdiv.bg)  
Technical University of Sofia

**COURSE STATUS IN THE CURRICULUM:** Compulsory subject from the curriculum / curricula for training of students to obtain Bachelor's degree, specialty Industrial Engineering, Professional orientation 5.13 General Engineering, Field 5 Technical Sciences.

**AIMS AND OBJECTIVES OF THE COURSE:** To provide understanding on the essentials for the product development with due consideration of design procedures and methods. This type of study will enable students to handle issues related to manufacturing, operation, service and basics operations at the design stage. An emphasis is placed upon practice of engineering design.

**DESCRIPTION OF THE COURSE:** The main topics concern: systematic approach to design; design for manufacture; technical aspects of product and system design; design planning methods and optimization; material selection; analysis and calculations; manufacturing design – case study.

**PREREQUISITES:** Physics, Mechanics; Applied Geometry and Engineering Graphics; Materials Science; Strength of Materials; CAD; Industrial Manufacturing Systems.

**TEACHING METHODS:** Lectures, laboratory work (defence of protocols) and course project with defence.

**METHOD OF ASSESSMENT:** Two one-hour assessments at mid and end of semester (70%), laboratory work (30%). Course project (100%).

**INSTRUCTION LANGUAGE:** English

**BIBLIOGRAPHY:** 1. Dimitrov L. Principles of Mechanical Engineering Design, Heron Press, Sofia, 2009. ISBN 978-954-580-257-7. 2. Dimitrov L., et all. Design of Machine Elements. Laboratory work. Heron Press, Sofia, 2011 ISBN 978-954-580-302-4. 3. Budinas R., J.K.Nisbett. Shigley's Mechanical Engineering Design, 9<sup>th</sup> ed., McGraw Hill, 2011, ISBN 978-0-07-352928-8.

## DESCRIPTION OF THE COURSE

Name of the course: <b>Human Resources Management</b>	Code: <b>BpIEe51</b>	Term: <b>6</b>
Type of teaching: Lectures (L) Seminars (S)	Contact hours per week: L– 22 h S – 15 h	Number of credits: <b>4</b>

**LECTURERS:** Professor Dr. Tony Mihova, tel.: 0888 42 45 70; email: mihova@tu-plovdiv.bg;

Assistant Anet Arabadzhieva, tel.: 0888 78 16 59, email: \_anet2003@abv.bg  
Sofia Technical University – Plovdiv Branch

**COURSE STATUS IN THE CURRICULUM:** A mandatory course for bachelor's degree students in Industrial Management at the Faculty of Mechanical Engineering (FEA).

**OBJECTIVES OF THE COURSE:** After completing the subject, students will gain in-depth knowledge of HRM theoretical foundations. They will become familiar with the specific problems in the field of organization and management of HR. The main objective is to expand, enrich and deepen their knowledge through solving practical tasks and cases study which will help them acquire practical skills and habits for independent work.

**COURSE DESCRIPTION:** Main topics: Introduction to the course HRM, Planning and organization of human resources, Analysis and planning of labor, Personnel selection and recruitment, Labor performance assessment, Training and development, Determination of salaries, Providing healthy and safe working conditions.

**TEACHING METHODS:** Lectures with presentations, discussions with active participation of students after preliminary preparation. Seminars – solving case studies, practical problems and essays, completion of assessment forms.

**METHODS OF ASSESSMENT:** Written exam, resulting in a mark, consisting of two components: exam - 50% and assessment of the performance during the seminars - 50%.

**LANGUAGE:** English

### **BIBLIOGRAPHY:**

1. Mihova, T., Human Resources management, Imeon Plovdiv, 2025
3. Human Resource Management, Department of Business Management, Digital Notes, 2022
4. Beginning Management of Human Resources, University of Minnesota Libraries, 2016
5. Charles Leatherbarrow, Introduction to Human Resource Management: A Guide to HR in Practice, 2014
6. Hugh Secord, Best Practices: Strategic Human Resources Management, Carswell, 2001

## DESCRIPTION OF THE COURSE

Name of the course: <b>Programming and use of industrial robots</b>	Code: <b>BpIEe53.1</b>	Semester: 6
Type of teaching: Lectures (L) Laboratory work (LW)/Tutorials (T)	Hours per semester: L – 22 hours T – 0 hours LW – 15 hours	Number of credits: 4
Course project (CP)		

**LECTURER(S):**

Assoc. Prof. Eng. Nikola Shakev, PhD (FEA), tel.: 032/659 528, e-mail: shakev@tu-plovdiv.bg  
 Technical University of Sofia

**COURSE STATUS IN THE CURRICULUM:** Elective subject from the curriculum / curricula for training of students to obtain Bachelor's degree, specialty Industrial Engineering, Professional orientation 5.13 General Engineering, Field 5 Technical Sciences.

**AIMS AND OBJECTIVES OF THE COURSE:** At the end of the course the students are expected to know the basic parameters and characteristics of industrial robots. They must be able to create programs for controlling the movements of an industrial robot, programing the input / output signals and robot interaction with other devices.

**DESCRIPTION OF THE COURSE:** The main topics concern: Mathematical formalization of the description of the robot's position; Kinematic models; Human-machine interface in industrial robots; RToolbox programming environment; Basic parameters and initializations for creating a project; Program commands for robot movement; Commands for control of digital inputs and outputs; Optimization of robot movements; Work in multitasking mode.

**PREREQUISITES:** Control Theory, Computing, Physics, Industrial Manufacturing Systems.

**TEACHING METHODS:** Lectures, using slides, case studies, laboratory work, work in teams, protocols.

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

**INSTRUCTION LANGUAGE:** English

**BIBLIOGRAPHY:** 1) Paul Sandin – Robot mechanisms and mechanical devices, McGraw-Hill, 2003, 2.) Corke, Peter I. Robotics, vision and control : fundamental algorithms in Matlab. 1st ed. New York: Springer, 2011. ISBN 9783642201431, 3) Craig, John J. Introduction to robotics : mechanics and control. 3rd ed. Upper Saddle Hall: Pearson Educacion Internacional, 2005. ISBN 0201543613, 4) RT ToolBox3 User’s Manual, Mitsubishi Electric Industrial Robots, <https://mitsubishielectric.com>,



## DESCRIPTION OF THE COURSE

Name of the course: <b>Sport</b>	Code: <b>FaBBpIEe3</b>	Semester: 5
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S) Self-Study (SS)	Hours per semester: L – 0 hours S – 0 hours SS – 30 hours	Number of credits: 1

### **LECTURER(S):**

Sen. Lect. Daniel Vladimirov, PhD (FEA), tel.: 032 659 646, e-mail: [danielv@tu-plovdiv.bg](mailto:danielv@tu-plovdiv.bg)

Sen. Lect. Petar Doganov, PhD (FEA), tel.: 032 659 648, e-mail: [pdoganov@tu-plovdiv.bg](mailto:pdoganov@tu-plovdiv.bg)

Sen. Lect. Boris Spasov, PhD (FEA), tel.: 032 659 647, e-mail: [boris\\_spasov@tu-plovdiv.bg](mailto:boris_spasov@tu-plovdiv.bg)

Technical University of Sofia-Branch Plovdiv

Technical University of Sofia

**COURSE STATUS IN THE CURRICULUM:** Facultative subject from the curriculum for training of students to obtain Bachelor's degree, specialties “INDUSTRIAL ENGINEERING in English”, 5.13 General Engineering, Field 5 Technical Sciences.

**AIMS AND OBJECTIVES OF THE COURSE:** Targeted at further developing of students' physical activities, skills and hygiene habits through effective methods of physical education, improving their mental and physical performance.

**DESCRIPTION OF THE COURSE:** The knowledge and skills in Physical Education and Sports develop a wide range of motor skills and habits, help the hardening of the body and contribute to the moral development of students. The enhancement of physical skills is carried out through:

1. General Physical Preparedness (GPP) – in these seminars the students develop a wide range of motor skill and habits; work to improve strength, speed, endurance, flexibility, structure and skill; increase resistance to unfavourable environmental factors; develop their physical qualities and experience.
2. Sports-Specific Physical Preparedness (SPP) – students improve their sport skills and habits in a specific sport and gain experience through participation in competitions; work to improve strength, speed, endurance, flexibility, structure and skill; increase resistance to unfavourable environmental factors; develop their physical qualities and experience.

**PREREQUISITES:** The curriculum presumes the minimum of knowledge and skills acquired at secondary school.

**TEACHING METHODS:** Seminars in accordance with the curriculum in PE and Sport.

**METHOD OF ASSESSMENT:** Evaluation is based on functional tests at the end of semester. Lecturer's signature is required at the end of semester.

**INSTRUCTION LANGUAGE:** Bulgarian

**BIBLIOGRAPHY:** 1. Владимиров В. Туризм и ориентиране. Методическо ръководство за студентите от ТУ София, филиал Пловдив. Издателство на ТУ - София. 2010.

## DESCRIPTION OF THE COURSE

Name of the course: <b>Sport</b>	Code: <b>FaBBpIEe4</b>	Semester: 6
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S) Self-Study (SS)	Hours per semester: L – 0 hours S – 0 hours SS – 30 hours	Number of credits: 1

### **LECTURER(S):**

Sen. Lect. Daniel Vladimirov, PhD (FEA), tel.: 032 659 646, e-mail: [danielv@tu-plovdiv.bg](mailto:danielv@tu-plovdiv.bg)

Sen. Lect. Petar Doganov, PhD (FEA), tel.: 032 659 648, e-mail: [pdoganov@tu-plovdiv.bg](mailto:pdoganov@tu-plovdiv.bg)

Sen. Lect. Boris Spasov, PhD (FEA), tel.: 032 659 647, e-mail: [boris\\_spasov@tu-plovdiv.bg](mailto:boris_spasov@tu-plovdiv.bg)

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Technical University of Sofia

**COURSE STATUS IN THE CURRICULUM:** Facultative subject from the curriculum for training of students to obtain Bachelor's degree, specialties “INDUSTRIAL ENGINEERING in English”, 5.13 General Engineering, Field 5 Technical Sciences.

**AIMS AND OBJECTIVES OF THE COURSE:** Targeted at further developing of students' physical activities, skills and hygiene habits through effective methods of physical education, improving their mental and physical performance.

**DESCRIPTION OF THE COURSE:** The knowledge and skills in Physical Education and Sports develop a wide range of motor skills and habits, help the hardening of the body and contribute to the moral development of students. The enhancement of physical skills is carried out through:

1. General Physical Preparedness (GPP) – in these seminars the students develop a wide range of motor skill and habits; work to improve strength, speed, endurance, flexibility, structure and skill; increase resistance to unfavourable environmental factors; develop their physical qualities and experience.
2. Sports-Specific Physical Preparedness (SPP) – students improve their sport skills and habits in a specific sport and gain experience through participation in competitions; work to improve strength, speed, endurance, flexibility, structure and skill; increase resistance to unfavourable environmental factors; develop their physical qualities and experience.

**PREREQUISITES:** The curriculum presumes the minimum of knowledge and skills acquired at secondary school.

**TEACHING METHODS:** Seminars in accordance with the curriculum in PE and Sport.

**METHOD OF ASSESSMENT:** Evaluation is based on functional tests at the end of semester. Lecturer's signature is required at the end of semester.

**INSTRUCTION LANGUAGE:** Bulgarian

**BIBLIOGRAPHY:** 1. Владимиров В. Туризм и ориентиране. Методическо ръководство за студентите от ТУ София, филиал Пловдив. Издателство на ТУ - София. 2010.