DESCRIPTION OF THE COURSE

Name of the course: **Mathematics 4**	Code: BIEe38	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 ,
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, 6th ed., 2019

2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th 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: **Control Theory II**	Code: **BpIEe391**	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):

Prof. Eng. Andon Topalov, PhD (FEA), tel.: 032 659528, e-mail: topalov@tu-plovdiv.bg
Assist. Prof. Eng. Vasil Popov, PhD (FEA), tel.: 032 659528, e-mail: vasil_popov@tu-plovdiv.bg
Technical University of Sofia, branch in Plovdiv

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. Perev, Control Theory. Laboratory Manual, Technical University - Sofia, 2006.

DESCRIPTION OF THE COURSE

Name of the course: **Materials Technology**	Code: **BpIEe40**	Semester: **5**
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S) Course work (CW)	Hours per semester: L – 26 hours S – 0 hours LW – 15 hours	Number of credits: **4**

LECTURER(S):
Assoc. Prof. Eng. Georgi Levicharov, PhD (FME), tel.: 659 624, e-mail: glevi@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: To give knowledge about the modern engineering materials in terms of production, fabrication characteristics and application; the basic manufacturing processes and their effect on material properties; design for manufacture; selection of materials, processes and processing routes.

DESCRIPTION OF THE COURSE: The main topics concern: Fundamentals of Metal Casting: crystallization, structure, defects and properties of castings. Metal-Casting Processes. Bulk Deformation Forming and Shaping Processes: rolling, extrusion and drawing, forging. strain hardening, recrystallization, cold and hot working. Sheet Metal Forming Processes: shearing, bending, deep drawing. formability tests. Joining. Welding processes: The welded joint: microstructure, defects, residual stresses and distortion, weldability. Soldering and brazing. Adhesive bonding. Metal removal processes. Heat treatment processes: mechanism of phase transformations, final structures and mechanical properties, strengthening, case hardening, annealing. Powder metallurgy: Forming, sintering, secondary finishing, design consideration. Forming and shaping of ceramics and glass. Processing of Polymers and Reinforced Plastics: structure and mechanical properties, forming and shaping polymers, structure of the composites.

PREREQUISITES: Physics, Chemistry, Introduction to Manufacturing and Industrial Practice, Materials Science.

TEACHING METHODS: Lectures, using slides, case studies, laboratory works with protocols.

METHOD OF ASSESSMENT: Exam at end of semester (82%), laboratories (18%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1.Kalpakjan, S., St. Schmid, Manufacturing Processes for Engineering Materials, (6^{th}edition), 2009; 2. Kalpakjan, S., St. Schmid, Manufacturing Engineering and Technology, (7^{th} edition), 2013; 3. Kalpakjan, S., St. Schmid, C. Kok, Manufacturing, Engineering and Technology, 2009; 4. Niebel, B.W., R.A. Wysk and A.B. Draper, Modern Manufacturing Processes Engineering, 1990; 5. Amsted, B.N., P.F. Ostwald, and M.L. Bengjamin, Manufacturing Processes, 1987; 6. Groover M.P., Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, (4^{th} edition), 2010; 7. Askeland, D.R., The Science and Engineering of Materials, 1990; 8. Ashby, M.F., D.H.R. Jones, Engineering Materials, vol. 2, 1988.

DESCRIPTION OF THE COURSE

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

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

COURSE STATUS IN THE CURRICULUM: Compulsory from the curricula for training of students to obtainBachelor'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: **Industrial Manufacturing Systems I**	Code: **BpIEe42**	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):
Assoc. Prof. Eng Iliya Chetrokov, (FME), tel.: 659 616, e-mail: 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 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. Driling. 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. .

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

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DESCRIPTION OF THE COURSE

Name of the course: **Measurements Systems**	Code: **BpIEe44**	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 (FA), tel.: 659 759, e-mail: 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 ystems, Longman, Scientific @ Technical. 1992; Doebelin E.O. Measurement Systems, Application and Design, 4th 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: **Industrial Manufacturing Systems II**	Code: **BpIEe46**	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: **5**

LECTURER(S):
Assoc. Prof. Eng Iliya Chetrokov, (FME), tel.: 659 616, e-mail: 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: **Thermodynamics and Heat Transfer**	Code: **BpIEe47**	Semester: **6**
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S) Course work (CW)	Hours per semester: L – 22 hours S – 15 hours LW – 15 hours	Number of credits: **5**

LECTURERS:

Habilitated Aleksandar Georgiev (FMU), phone: 032 659 513, e-mail: AGeorgiev@gmx.de

Non habilitated Emil Toshkov (FMU), phone: 032 659 513, e-mail: emtoshkov@gmail.com

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: **Technical safety**	Code: **BpIEe48**	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 (FA), tel.: 659 759, e-mail: 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: **Production Operation Management II**	Code: **BpIEe49**	Semester: 6
Type of teaching: Lectures (L) Seminars (S)	Hours per semester: L – 22 hours S – 15 hours	Number of credits: 4

LECTURER(S):

Assoc. Prof. Katya Stefanova, PhD (FEA), tel: 032 659 764,
e-mail: kstef@tu-plovdiv.bg
Assist. Prof. Elena Zlatanova-Pazheva, PhD (FME), tel.: 032 659 712,
e-mail: elyzlatanova@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.

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

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DESCRIPTION OF THE COURSE

Name of the course: **Manufacturing Design I**	Code: **BpIEe50**	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: **4**

LECTURER(S):
Assoc. Prof. Eng Iliya Chetrokov, (FME), tel.: 659 616, e-mail: 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, 9th ed., McGraw Hill, 2011, ISBN 978–0–07–352928–8.

DESCRIPTION OF THE COURSE

Name of the course: **Human Resource Management**	Code: **BpIEe51**	Semester: **6**
Type of teaching: Lectures(L) Laboratory work (LW)/Tutorials (T) Course work (CW)	Hours per semester: L – 22hours T– 15 hours LW – 0 hours	Number of credits: **4**
Course project (CP)	Code: **BIE…1**	Number of credits:

LECTURER(S):

Assoc. Prof. Toni Mihova, PhD (FME), tel.: 0893 69 06 55; e-mail: mihova@tu-plovdiv.bg

Assist. Prof. Desislava Shatarova, PhD (FME), tel.: +359 32 659 716, e-mail: desislava@tu-plovdiv.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum for training of students to obtainBachelor'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 will have a basic knowledge on fundamentals and the key role of HRM, understand how to use HRM to hire, develop, motivate, and retain the right people. The HRM course will help the students to understand the importance of personal development, performance management and training, as well as best practices and newest trends by focusing on applying different HRM methods to attract, select, retain, and motivate the right employees for the company and job. The HRM course focuses on developing both, knowledge and skills for future engineers. By developing competence and confidence in using important HRM knowledge and skills, students will be better prepared to make effective use of HRM tools and practices and to become better managers and more effective leaders. As a result, students will improve analytical and problem-solving skills, communication, presentation, teamwork, decision making and be able to apply those skills in solving HRM and engineering problems in practice and in the workplace..

DESCRIPTION OF THE COURSE: The main topics concern: Defining HRM: Organizational processes and resources, Management models and basic concepts of HRM. The Mission of HRM: Attraction, Selection, Training, Assessment, Rewarding. Human behavior at work: Motivation and engagement at work. Working groups, teambuilding. Leadership and participation. Job analysis and job design. Work design and workforce planning. Managing the Work Environment and Increasing Employee Engagement. Creating a Healthy Work Environment. Creating Positive Employee-Management Relations. Managing Engagement and Turnover. Health and safety. Recruitment, selection and induction. Promotion, transfer, retirement, dismissal. Labor turnover. Performance management. Training, development and qualification. Appraisal and evaluation. Managing Employee Retention. Remuneration systems. Managing Total Rewards. Base Compensation. Incentives, Rewards and Benefits. Practices and trends in HRM. Standardization and new trends in HRM. HR Challenges, etc.

PREREQUISITES: Management, Financial Accounting, Manufacturing Strategies.

TEACHING METHODS:Lectures, using slides and videos, case studies using in practice, work in teams.

METHOD OF ASSESSMENT: Test, one-hour assessments at end of semester (60%), participation during seminars and discussion questions and topics (20%) and case studies, and students presentations of one of the topics (20%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1. Noe, Raymond, John Hollenbeck, Barry Gerhart, Patrick Wright, Fundamentals of Human Resource Management, McGraw-Hill Education; 8th edition, 2019, ISBN-10:1260565769, ISBN-13:978-1260565768; 2. Armstrong, Michael, Stephen Taylor, Armstrong's Handbook of Human Resource Management Practice, Kogan Page, 15th edition, 2020, ISBN-10:0749498277, ISBN-13:978-07494982763. 3. Raymond Andrew Noe, John R. Hollenbeck, Barry Gerhart, Patrick M. Wright Hook, Human Resource Management, McGraw-Hill Education, 12th edition, 2020, ISBN-10:1260570746, ISBN-13:978-1260570748; 4. Caroline, Andrew Jenkins, Introducing Human Resource Management 8th Edition, Pearson; 8th edition, 2019, ISBN10:1292230347, ISBN13:978-1292230344; 5. Verhulst, Susan L., David A. DeCenzo, Fundamentals of Human Resource Management, 13th Edition,Wiley, 2018, ISBN-13:978-1119495338,ISBN-10:1119495334, etc.

DESCRIPTION OF THE COURSE

Name of the course: **Programming and use of industrial robots**	Code: **BpIEe53.1**	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: **Industrial electronics and electric drives**	Code: **BpIE53.2**	Semester: **6**
Type of teaching: Lectures(L) Laboratory work (LW)	Hours per semester: L – 22hours LW – 15 hours	Number of credits: **4**

LECTURER(S):
Chf. Asst. Prof. Valentin Petrov, PhD (FEA), tel.: 032 659 584, e-mail: v.spasovv@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory elective subject from the curriculum for training of students to obtain Bachelor's degree, specialty 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 types of energy converters used in the industry, to be able to select appropriate converters for specific applications, to know structures and characteristics of the electric drives with fundamental types of electric motors, to be able to select electric motors and energy converters for practical applications.

DESCRIPTION OF THE COURSE: The main topics concern: power electronics semiconductors – types, theory of operation, characteristics and applications; rectifiers – schematics, theory of operation, applications; DC to DC converters – circuits, theory of operation; DC to AC converters (inverters); electric drives – basic term, block diagrams of modern electric drives; DC motor, induction motor, permanent magnet synchronous motor and brushless DC motor drives.

PREREQUISITES: Control Theory, Elements of Industrial Automation, Electrical Engineering, Electronics.

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

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

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY:1. Yordanova, S., N. Kolev, R. Lichev. Elements of Industrial Automation. TU-Sofia, 1997. 2. Rashid, M.H. Power Electronics. Circuits, Devices and Applications. Second edition. Prentice-Hall International, 1993. ISBN 0-13-334483-5, 3.Dewan, S.B., G.R. Slemon, A. Straughen. Power Semiconductor Drives. John Wiley and Sons, 1984. ISBN 0-471-62900-6; 4. Sen, P.C. Principles of Electric Machines and Power Electronics. John Wiley and Sons, 1989.8. 5. Krishnan R., Permanent Magnet Synchronous And Brushless DC Motor Drives, Taylor and Francis Group, 2010 6. Hanselman D., Brushless Permanent-Magnet Motor Design Second Edition, Magna Physics Publishing, 2006 7. Marino R., Tomei P. - Induction Motor Control Design, Springer London Dordrecht Heidelberg New York, 2010