DESCRIPTION OF THE COURSE

Name of the course:	Code: **BpIEe20**	Semester: 3
Mathematics 3		
Type of teaching:	Hours per semester:	Number of credits: 4
Lectures (L)	L – 22 hours	
Seminars (S)	S – 16 hours	

LECTURER(S):

Assoc. Prof. Vasil Petrov, PhD (FME) , tel.: 032 659 680 email: 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: Getting some basic knowledge about functions of several variables, especially the methods for solving extremal problems – critical points, Lagrange multipliers. Learning basic facts about power series and Fourier series. Getting acquainted with Laplace and Fourier transforms and their applications.

DESCRIPTION OF THE COURSE: Main topics: *functions of several variables:* partial derivatives, gradients, directional derivatives, critical points, the method of Lagrange multipliers, Least Squares method; *power series:* convergence, sum, Taylor and Maclaurin series; *Fourier analysis:* Fourier series and Fourier transform; *operational calculus:* Laplace transform and its applications for solving ODE and systems of ODE.

PREREQUISITES: Mathematics 1 (BpIEe01), Mathematics 2 (BpIEe10.

TEACHING METHODS: Lectures and Seminars.

METHOD OF ASSESSMENT: Written exam.

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th ed., 2018

DESCRIPTION OF THE COURSE

Name of the course:	Code: **BpIEe21**	Semester: **3**
Strength of materials		
Type of teaching: Lectures (L) Seminars (S) Laboratory work (LW) Course work (CW)	Hours per semester: L – 22 hours S – 16 hours LW – 15 hours	Number of credits: 5

<u>**LECTURER(S)**</u>:

Assoc. Prof. Eng. Raycho Raychev, PhD (FME), tel.: 0895581138, e-mail: rpraichev@tu-plovdiv.bg

Assist. Prof. Eng. Ivanka Delova (FME), tel.: 0898960191, e-mail: ivankadelova@tu-plovdiv.bg

Technical University of Sofia, Branch Plovdiv

<u>**COURSE STATUS IN THE CURRICULUM**</u>: Compulsory subject from the curriculum for teaching students for educational qualification degree "Bachelor", for the specialty "Industrial Engineering" (in English) from the professional field: 5.13. General engineering, Field 5 Technical Sciences.

<u>**AIMS AND OBJECTIVES OF THE COURSE:**</u> The students must acquire knowledge in stress-strain analysis of parts and structures which is needed for studying of special subjects as well as learn practical methods for strength design of beams and bars.

<u>**DESCRIPTION OF THE COURSE:**</u> The main topics concern: Main principles and hypothesis; Geometrical characteristics of plane figures; Internal forces in straight beams, and planar frames; Design in case of: pure tension (compression), pure bending, unsymmetrical bending, combination of bending and tension (compression), bending and shearing (transverse loading), pure torsion, bending and torsion; State of stress at a point; Hooke's law; Conditions for strength in case of complex stress; Buckling of compressed bars; Materials fatigue; Introduction to computer methods in engineering.

<u>**PREREQUISITES:**</u> Mathematics, Physics, Material science, Mechanics.

<u>**TEACHING METHODS**</u>: Lections, seminars and laboratory work according to the classical method and/or multimedia presentations and computer simulations.

<u>**METHOD OF ASSESSMENT:**</u> During the semester, the defense of correctly solved tasks from the course work is evaluated. Exam consisting of two problems and two theoretical questions.

<u>**INSTRUCTION LANGUAGE:**</u> English

<u>**BIBLIOGRAPHY:**</u> 1.Da Silva V.D. "Mechanics and Strength of Materials", Springer, 2006

2. Nash William A., Potter Merle C. "Strength of Materials", McGraw Hill Professional, 2010.

3. Nash William A. "Theory and Problems of Strength of Materials", McGraw-Hill, 1998.

DESCRIPTION OF THE COURSE

Name of the course: **Electrical Engineering II**	Code: **BpIEe22**	Semester: **3**
Type of teaching: Lectures (L) Laboratory work (LW) Seminars (S) Course work (CW)	Hours per semester: L – 22 hours S – 16 hours LW – 15 hours	Number of credits: **5**

LECTURER(S):

Assoc. Prof. Eng. Vasil Spasov, PhD (FEA), tel.: 032 659-535, e-mail: vasilspasov@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 the students the necessary minimum of theoretical and practical knowledge of electromechanical devices for energy conversion. To acquaint the students with the construction, principle of operation and characteristics of the main types of DC and AC electromechanical devices, protection and switching apparatus.

DESCRIPTION OF THE COURSE: The main topics concern: Transformers - construction, principle of operation and equivalent circuit; Autotransformers; DC machines - construction, types and basic equations; Characteristics in generator and motor mode; Starting and speed control of DC motors, losses and efficiency; Synchronous machines - construction and principle of operation; Round-rotor and salient pole synchronous generator; Round-rotor synchronous motor; Induction machines - construction and principle of operation; Equivalent circuits of a three-phase induction motor; Speed and torque control of induction motors; Starting of induction motors; Protection and switching apparatus - fuses, automatic circuit breakers, electromagnetic contactors.

PREREQUISITES: Mathematics, Physics, Electrical Engineering I.

TEACHING METHODS: Lectures, seminars and laboratory work. The lectures are delivered using multimedia. The laboratory exercises are provided with a manual and are carried out in a laboratory with developed models and stands. The students prepare for every exercise an individual protocol that is defended before the supervising lecturer.

METHOD OF ASSESSMENT: Laboratory exercises (20 %), course work with two tasks (20 %) and written exam (60 %).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1. Darjanov P., I. Marinova, D. Darjanova. Electrical Engineering II, Amadeus's Company Ltd., Sofia, 2006; 2. Ganguly P. Introduction to electrical engineering, PHI Learning Pvt. Ltd., 2013; 3. Fitzgerald A. E. Electric machinery, McGraw-Hill, SI Metric Edition, 1985; 4. Chapmann S. Electrical machinery fundamentals, 4th ed., McGraw Hill, 2005; 5. Smeaton R., W. Ubert. Switchgear and Control Handbook, - 3rd ed., McGraw-Hill, 1998; 6. Ida N. Engineering Electromagnetics, Springer-Verlag, N. Y., 2000; 7. Nasar S. Schaum's outline of theory and problems of electric machines and electromechanics, McGraw–Hill, 1998, ISBN 0-07-045994-0; 8. Bell A. and R. Whitehead, Basic Electrical and Electronic Engineering, Blackwell scientific publications, 1993. 9. Mukerji S. Electromagnetics for Electrical Machines, CRC Press, London, 2015, ISBN 978-1-4987-0915-6; 10. Warne D. Newnes Electrical Power Engineer's Handbook, 2nd ed., Elsevier, 2005, ISBN 0-7506-6268-9.

<div align="center">**DESCRIPTION OF THE COURSE**</div>

Name of the course **Electronics II**	Code: **BpIEe23**	Semester: **3**
Type of teaching: Lectures (L) Laboratory work (LW)	Hours per semester: L – 24 hours LW – 21 hours	Number of credits: **4**

LECTURERS:

Prof. Eng. Galidiya Petrova, PhD (FEA), tel.: 659 576, e-mail: gip@tu-plovdiv.bg,
Technical University of Sofia, Plovdiv branch, Department of Electronics

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curricula for training of students to obtain Bachelor's degree, specialty "Industrial engineering (in English)", 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 have basic knowledge on theoretical and practical aspects of digital electronic and pulse circuits together with their functional purpose and modes of operation.

DESCRIPTION OF THE COURSE: The main topics concern: Logical function and methods for description and minimization; Basic elements of digital electronics, combinatorial circuits - multiplexer, decoders, code converters, binary adders, digital comparators. Main types of flip-flops: RS, D, JK, T. Synchronous and asynchronous flip-flops. Applications of sequential elements: registers, shift registers, counters, etc. Practical consideration of sequential logic design; Indicator elements and digital circuits for their control; Design and working principles of relaxation circuits, mono-vibrators and multi-vibrators; DAC, ADC and S/H devices – their basic characteristics and operation.

PREREQUISITES: Good fundamental knowledge in the courses: Physics, Electrotechnic I and Electronics I.

TEACHING METHODS: Lectures using multimedia presentations and laboratory exercises with protocols containing experimental results.

METHOD OF ASSESSMENT:
Two one-hour assessments with the solution of practical problems in digital electronics at mid and end of semester (80%), laboratories (20%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY:
1. Mihov G., Digital electronics for BSc students in Electronics, Technical University – Sofia press, 1998; 2. Spasov, Gr., D. Petrova, A. Kostadinov. Digital and microprocessor technology. TU-Sofia, 2012; 3. Paul Horowitz, The art of electronics, Winfield Hill, ISBN: 978-0-521-80926-9; 4. Storey Neil. Electronics. A System Approach, UK Addison Weslly, 1992 г.

DESCRIPTION OF THE COURSE

Name of the course: **Informatics III**	Code: **BpIEe24**	Semester: **3**
Type of teaching: Lectures(L) Laboratory work (LW)/Tutorials (T) Course work (CW)	Hours per semester: L – 16hours T– 0 hours LW – 21 hours	Number of credits: **4**

LECTURER(S):

Assoc. Prof. Eng. Nikolay Kakanakov, PhD (FEA, CST), tel.: 659 765, e-mail: kakanak@tu-plovdiv.bg

Technical University of Sofia Plovdiv branch

COURSE STATUS IN THE CURRICULUM: Compulsory 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 of computer organization and architecture, to know the main components of a computer systems and its functions. They are also expected to know the basics of operating systems and its functions as a computer-human interface.

DESCRIPTION OF THE COURSE: The main topics concern: data representation in computers; computer organization and peripherals, computer architectures and main models. X86 and x64 programming models. Operating systems and its main functions. Command-line interface, graphical user interfaces, kernel and system functions. OS examples – MS Windows and *nix families.

PREREQUISITES: Informatics 1 and 2.

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

METHOD OF ASSESSMENT: One assessments at the end of semester (70%), laboratories (30%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1. William Stallings, Computer Organization and Architecture: Designing for Performance, Prentice Hall, 2000; 2. John L. Hennessy, David A. Patterson, Computer Organization and Design: The Hardware / Software Interface, Издател Elsevier, 2014, ISBN:1483221180, 9781483221182; http://free-electrons.com/doc/training/linux-kernel/linux-kernel-slides.pdf; http://www.doc.ic.ac.uk/~wjk/UnixIntro/; http://www.linuxcertified.com/linux-device-driver-training.html.

Name of the course: **Economics**	Code: **BpIEe25**	Semester: **3**
Type of teaching: Lectures(L) Laboratory work (LW)/Seminars (S) Course work (CW)	Hours per semester: L – 22hours S – 15 hours LW – 0 hours	Number of credits: **3**

LECTURER(S):

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 obtain Bachelor's degree, specialty Industrial Engineering, Professional orientation 5.13 General Engineering, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: This course provides introduction to economic analysis and theory and how they apply to current events. At the end of the course the students will be able to use theoretical models, quantitative and qualitative tools, and critical thinking to develop a deep understanding of economic issues and solutions and to apply those principles into the business, in solving an engineering issues and by making a decision.

DESCRIPTION OF THE COURSE: The main topics include: Principles of Economics: Introduction to Microeconomics. Microeconomic analysis. Supply, Demand and Market Equilibrium. Elasticity and its applications. Consumer Choice. Production. Cost, Revenue and Profit. The Price System. The Main Types of Competition and their features. Profit Maximization under competition. Labor Markets. Game Theory; Principles of Economics: Macroeconomics. Macroeconomic analysis. Macroeconomics Performance Indicators, an overview of Gross Domestic Product (GDP) and the difference between nominal and real GDP. Savings, Investment, and the Financial System. Personal Finance. The Aggregate Demand and Aggregate Supply and using AD-AS model. Business Cycle and Economic Growth – an insight into the different models of economic growth. Unemployment – types and measuring. Labor Force Participation. Inflation - measuring, causes and types. Quantity Theory of Money. Real Income. Fiscal Policy. Monetary Policy. Money and Banking system. Understanding the fractional Reserve Banking and Credit and Reserve Requirements. The role of Cash Rates and Open Market Operations, Globalization, International Trade and Financial Markets, Exchange Rate Systems, International Financial Policy and Open Economy, Understanding the Business Economics, etc.

PREREQUISITES: Mathematics, Quantitative methods and statistics.

TEACHING METHODS: Lectures, using slides and videos, seminars with tests, assignments, case studies and teamwork.

METHOD OF ASSESSMENT: Test, one-hour assessments at end of semester (70%), seminars, tests, case studies and presentations (30%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1. Mankiw, Gregory, N., Principles of Economics, Cengage Learning, Inc, 8th edition, Mason, OH, United States, 2017, ISBN10:1305585127, ISBN13:9781305585126; 2. Mankiw, Gregory, N., Principles of Microeconomics, Cengage Learning, Inc, Edition Statement 8th edition, Mason, OH, United States, 2017, ISBN10:1305971493, ISBN13:9781305971493; 3. Mankiw, Gregory, N., Principles of Macroeconomics, Publisher Cengage Learning, Inc, Edition Statement 8th edition, Mason, OH, United States, 2017, ISBN10: 1305971507, ISBN13: 9781305971509; 4. Baye, Michael, Jeff Prince,

DESCRIPTION OF THE COURSE

Course title: **Measurement and Instrumentation, Part I**	Code: **BpIEe26**	Semester: **3**
Type of teaching: Lectures Laboratory exercises	Hours: L - 22 hours; LE - 15 hours.	number of credits: **4**

LECTURER: Associate prof. **Margarita Deneva**, Dept. "Electrical engineering", tel. 0895 587 439, e-mail: deneva@tu-plovdiv.bg, Technical University of Sofia, Branch Plovdiv

COURSE STATUS IN THE CURRICULUM: Mandatory course for students of the "Industrial Engineering" specialty in English, educational qualification "Bachelor".

AIMS AND OBJECTIVES OF THE COURSE: The objectives are related to the orientation of the students to get acquainted with and master the basic system of measurement units, their relationship and their practical use, as well as to be properly introduced to the basics of metrology and metrological assurance. The aim is to concentrate students' attention on the most important techniques that will be used in the present and presumably in the future. The aim of the group laboratory exercises is to supplement the lecture material with new knowledge through a practical presentation of specialized measurement approaches. They are joined by the solution of targeted thematically shaped case studies aimed at facilitating the understanding of the practical implementation of the specific measurement.

DESCRIPTION OF THE COURSE: Based on interdisciplinary approaches, the course comprises three main distinct modules: basic principles on which scattering instruments are built, measurement of electrical quantities and measurement of non-electrical quantities. In addition to classical measurement methods, the course also focuses on modern measurement techniques and tools. The presentation of the material is intended to be at a level that will be of use primarily to engineers using measurement devices, rather than to designers of measurement instruments. Familiarity and understanding of errors made in the performance of specific measurements is essential. The principles of using computer virtual measuring instruments are also included in the considerations.

PREREQUISITES: Physics, Mathematics, Electrical engineering, Electronics, Computing, Measurement and instrumentation.

TEACHING METHODS: Lectures, using multimedia projector, case studies, use of interactive materials appropriate to the topic under consideration. The practical exercises have protocols with defense.

METHOD OF ASSESSMENT: Two-hour assessment and solving given tasks at the end of the semester (70%) and practical exercises (30%).

INSTRUCTIONAL LANGUAGE: English.

BIBLIOGRAPHY: 1. Book "Measurement and Instrumentation", part I, edited by N. Kolev, authors: R.Dinov, I. Kalchev, I. Kogjabashev, N. Kolev, T. Tashev, P. Tzvetkov' Technical University of Sofia, 2006 ; **2.** Росен Василев, "Измервателна техника и метрология" (2021), Изд.: Медицински университет - Варна, ISBN: 978-619-221-315-2;**3.** Allan H. Robbins, Wilhelm C Miller, "Circuit Analysis. Theory and Practice", 2nd edition, Robbins & Miller; **4.** Prithwiraj Purkait, Budhaditya Biswas, Santanu Das, Chiranjib Koley, "Electrical and Electronics Measurements and Instrumentation", ISBN (13): 978-1-25-902959-2 (2013); **5.** Ricardo D. Quintero Jr, ат ал., "Familiarization with Electrical Measuring Instruments", Mapua University, School of Electrical, Electronics and Computer Engineering (2019); **6.** "A Textbook of Electrical Technology, Chapter 10: Electrical instruments and measurements", pp. 375 – 452, BL Theraja volume1 Books.**7.** International vocabulary of metrology – Basic and general concepts and associated terms (VIM), March 2014.

DESCRIPTION OF THE COURSE

Name of the course: **Sport**	Code: **BpIEe27**	Semester: 3
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 Vladimdirov, PhD (FEA), tel.: 032 659 646, e-mail: danielv@tu-plovdiv.bg
Sen. Lect. Petar Doganov, PhD (FEA), tel.: 032 659 648, e-mail: pdoganov@tu-plovdiv.bg
Sen. Lect. Boris Spasov, PhD (FEA), tel.: 032 659 647, e-mail: boris_spassov@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, specialties "INDUSTRIAL ENGINEERING in English", Professional orientation 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 and "Pass grade".

INSTRUCTION LANGUAGE: Bulgarian

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

DESCRIPTION OF THE COURSE

Name of the course: **Control Theory I**	Code: **BpIEe28**	Semester: 4
Type of teaching: Lectures(L) Laboratory work (LW)/Tutorials (T) Course work (CW)	Hours per semester: L – 26hours LW – 15 hours	Number of credits: 4
Course project (CP)		

LECTURER(S):

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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 introduce basic notions, approaches and methods from the classical and so called modern control theory, to build basic skills for their application and for the usage of software products for analysis and synthesis of control systems, and to create possibilities for acquisition of new knowledge in this area..

DESCRIPTION OF THE COURSE: Main topics: Basic notions – control system, main building principles, classification. Mathematical description of the control systems – differential equations, linearization, Laplace transform, transfer functions. First-order and second-order systems. Block-diagrams description. Typical input signals and time-domain characteristics Performance parameters for the system time response. Characteristics of first-order and second order systems. Frequency-domain characteristics for first-order, second order and higher order systems. Performance parameters of the system response in the frequency domain. Root locus method – features, application in tasks for analysis of control systems. Discrete-time systems. Description of discrete-time signals. Inverse Z- transform. Discrete-time transfer functions of open-loop and closed-loop systems..

PREREQUISITES: Mathematics, Physics, Mechanics, Electrical Engineering, Informatics.

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

METHOD OF ASSESSMENT: One two-hour assessment at the end of the semester (80%), 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: **Fluid Mechanics**	Code: **BpIEe29**	Semester: **IV**
Type of teaching: Lectures (L) Tutorials (T) Laboratory works (LW)	Hours per semester: L – 15 hours T – 15 hours LW - 15 hours	Number of credits: **4**

LECTURERS:

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Emil Toshkov PhD, phone: +359 32 659 513, e-mail: emtoshkov@tu-plovdiv.bg

Assist. Prof. Eng. George Djurkov (FME), phone: +359 32 659 622, e-mail: george.djurkov@tu-plovdiv.bg
Technical University of Sofia, branch Plovdiv

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum of students to obtain Bachelor's degree in specialty Industrial Engineering, Faculty of Electronics and Automation, Technical University of Sofia, branch Plovdiv, Professional orientation 5.13. General Engineering, Field 5 Technical Sciences.

AIMS AND OBJECTIVES OF THE COURSE: The program is organized so that to build both theoretical background and practical skills necessary for understanding and further studies in the field of applied fluid dynamics and theoretical predictions. Special attention is paid to recent achievements in flow measurements and computational fluid dynamics. The program is correlated with the other subjects (inputs and outputs) related to Fluid Mechanics.

DESCRIPTION OF THE COURSE: The main topics concern: Basic characteristics of fluids: continuity, density, compressibility, viscosity; Newtonian and nonnewtonian fluids. Fluid statics: mass and surface forces; pressure and pressure gradient; fluid equilibrium; fluid under acceleration; pressure measurements. Fluid kinematics: Lagrangian and Eulerian flow description; substantial derivative; flow patterns - streamlines, streaklines, pathlines; streamline coordinates; fluid element kinematics; linear motion and deformation; angular motion and deformation. Fluid dynamics fundamental equations: mass conservation - continuity equation; conservation of linear momentum; the linear momentum equation, the moment of momentum equation; energy conservation; inviscid flow dynamics - Euler's equation of motion; the Bernoulli equation for irrotational flow. Viscous flow dynamics: Newtonian stress-deformation relationships; the Navier-Stokes equations. Dimensional analysis: Π-theorem; modelling and similitude; laminar and turbulent flow; the Reynolds equations. Pipe flows: head losses; flow over immersed bodies - lift and drag concepts; boundary layer; the Prandtl equation.

PREREQUISITES: Physics, Mechanics, Mathematics, Informatics and computer practice.

TEACHING METHODS: Lectures, using slides, case materials and examples from Internet; solving problems; laboratory works in teams; protocols - preparation and defense.

METHOD OF ASSESSMENT: One one-hour assessment at the mid of the semester (20%), laboratories (30%), exam at the end of the term(50%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY:

1. B. S. Massey, Mechanics of Fluids, 8-th edition, 2006, Chapman & Hall, London.

2. White F. M., Fluid Mechanics, 7-th edition 2010, McGraw Hill Book Company, e-book: www.mhhe.com/engcs/mech/white.

3. Munson B. R., D. F. Young, T. H. Okushi, Fundamentals of fluid Mechanics, John Wiley & SonsInc., New Yourk, ISBN 0-471-57958-0, 1994.

4. Furness R. A. Fluid flow measurements, Logman Group UK Ltd., ISBN 0-582-03165-6, 1990.

5 J. F. Douglas and R. D. Matthews, Solving Problems in Fluid mechanics, Vol. 2, 1996, Longman Sci. &Tech., England.

6 S. Tabakova, S. Radev, Fluid Mechanics, Sofia, TU-Sofia, 2011 (in Bulgarian).

7 Multimedia Fluid Mechanics DVD-ROM, 2nd Edition 2008, Edited by G. M. Homsy, University of California, Santa Barbara.

DESCRIPTION OF THE COURSE

Name of the course: **Fundamentals of design**	Code: **BpIEe30** CP **BpIEe36**	Semester: **4**
Type of teaching: Lectures (L) Seminars (S) Course project (CP)	Hours per semester: L – 30 hours S – 15 hours LW-15 hours	Number of credits: **4** **(CP 1)**

LECTURER(S):

Assist. Eng. Konstantin Chukalov, PhD (FME), tel.: 659 618, e-mail: chukalov@tu-plovdiv.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curriculum for education of students learning 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 have theoretical and practical knowledge to create design drawing and technical documentation according standards

DESCRIPTION OF THE COURSE: The main topics concern: Engineering graphics, technical documentation ,machine elements ,standardization and applied geometry, tolerances and fits, CAD-systems.

PREREQUISITES: Applied geometry and engineering graphics .

TEACHING METHODS: Lectures using laptop and multimedia projector. Conducting seminars working in teams to solve tasks,course project

METHOD OF ASSESSMENT: Final exam (100%),.

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1. SHIGLEY'S MECHANICAL ENGINEERING DESIGN, NINTH EDITION Published by McGraw-Hill, a business unit of The McGraw-Hill Companies, Inc., 1221 Avenue of the Americas, New York, NY 10020. Copyright © 2011 by The McGraw-Hill Companies, Inc. ,.

DESCRIPTION OF THE COURSE

Name of the course: **Informatics IV**	Code: **BpIEe31**	Semester: **4**
Type of teaching: Lectures(L) Laboratory work (LW)/Tutorials (T) Course work (CW)	Hours per semester: L – 15 hours T– 0 hours LW – 15 hours	Number of credits: **3**

LECTURER(S):

Assoc. Prof. Eng. Nikolay Kakanakov, PhD (FEA, CST), tel.: 659 765, e-mail: kakanak@tu-plovdiv.bg

Technical University of Sofia Plovdiv branch

COURSE STATUS IN THE CURRICULUM: Compulsory 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 of computer networking, the idea of open systems interconnection, the main building blocks of internet, the protocols behind new communication channels, basic ideas of network testing and administration.

DESCRIPTION OF THE COURSE: The main topics concern: Networking concepts: Network Edge, Media access; Network Core, OSI model; IP, Subnetworking; NAT, DHCP; TCP; UDP & DNS; HTTP, P2P; Sockets; Web. Network administration: command line network configuration; network testing, packet capture and analyses; network device configuration and monitoring.

PREREQUISITES: Informatics 1, 2 and 3.

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

METHOD OF ASSESSMENT: One assessments at the end of semester (70%), laboratories (30%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1. James F. KuroseKeith W. Ross, Computer Networking: A Top-down Approach, Pearson, 2016, ISBN:1292153598, 9781292153599; 2. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Pearson, 2013, ISBN: 1292024224, 9781292024226; 3. Mani Radhakrishnan and Jon Solworth, Socket Programming in C/C++, presentations from cs.uic.edu; 4. Fulvio Risso, Exercises on IP Addressing, Politecnico di Torino, March 2, 2013; 5. Fulvio Risso, Exercises on Packet Sniffing and Traffic Analysis, Politecnico di Torino, March 2, 2013; 6. Fulvio Risso, Local Area Networks Exercises, Politecnico di Torino, March 2, 2013;

DESCRIPTION OF THE COURSE

Name of the course: **Measurement and Instrumentation II**	Code: **BpIEe32**	Semester: 4
Type of teaching: Lectures (L) Laboratory work (LW)/Seminars (S) Course work (CW)	Hours per semester: L – 15 hours S – 0 hours LW – 30 hours	Number of credits: 4

LECTURER(S):

Assoc. Prof. Eng. Stanimir Stefanov, PhD (FEA), tel.: 032659512, e-mail: glasst@tu-plovdiv.bg

Assoc. Prof. Eng. Dimitar Spirov

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Mandatory course in the curriculum for students pursuing a Bachelor's degree, specialization in "Industrial Engineering," professional field 5.13. General Engineering, area 5. Engineering Sciences.

AIMS AND OBJECTIVES OF THE COURSE: To provide fundamental knowledge of the theory of measurements and the principles of measuring non-electrical quantities. In addition to classical measurement methods, modern methods and tools for measurement are also covered. The ultimate goal is for students to become familiar with the most important aspects of measuring equipment that will be used in the near future.

DESCRIPTION OF THE COURSE: Main topics: Sensors – strain gauges, inductive, capacitive, temperature, piezoelectric, optical, and others. Intelligent sensors; Measurement of linear and angular displacements; Measurement of mechanical stress and force; Pressure measurement; Flow measurement – using differential pressure, variable cross-section, electromagnetic, ultrasonic, and other methods; Level measurement – using capacitive, radiation, and pressure sensors; Temperature measurements.

PREREQUISITES: Physics, Electrical Engineering, Electronics, Control Theory, Technical Means of Automation, Computer Science.

TEACHING METHODS: The lectures are illustrated with slides, while the laboratory exercises are conducted using educational models. The exercises are carried out in groups, with preparation and defense of reports.

METHOD OF ASSESSMENT: A two-hour written exam at the end of the semester)

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1.Kolev N., I. Petrov (edited by-), Measurement and Instrumentation, TU - Sofia, 1998; 2. Kolev N. (edited by-), Laboratory Manual on Measurement and Instrumentation , TU - Sofia, 1999; 3. Doebelin E. O., Measurement Systems, Mc.Graw-Hill Book Co., Singapore, 1990; 4. Jones L. D., A. F.Chin, Electronic Instruments and Measurement, Prentice Hall, USA,1992; 5. Feedback Instruments Ltd - Manuals 2942, 342A/B, EEC470/1/2/3/4/7, UK, 1996.

DESCRIPTION OF THE COURSE

Name of the course: **Enterprise Management**	Code: **BpIEe33**	Semester: 4
Type of teaching: Lectures(L) Seminars (S)	Hours per semester: L – 26hours S – 16 hours	Number of credits: **4**

LECTURER(S):
Assoc. Professor Georgi Georgiev, PhD tel. 659706, email: georgi@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: Upon completion students will have basic knowledge of the main managerial functions and processes in the contemporary organization, regardless of its status and area of operation. This knowledge is fundamental for the functional managerial courses taught later. Basic knowledge in Marketing also will be acquired.

DESCRIPTION OF THE COURSE: Within the Enterprise Management course the main topics discussed are: The organization and its environment; Evolution of the managerial thought and practice; The management process and the work of managers – main managerial functions, roles, skills and dilemma; Managerial decisions – process and methods; Planning – essence, process and strategic aspects; Organizing - essence, process and organizational structures; Motivation – essence, general model of motivation, process and content theories of motivation, motivation approaches; Leadership – basic model of leadership, basic leadership theories and approaches; Groups in the organization – types of groups, characteristics of the groups, management of conflicts; Controlling-essence, types of control, controlling methods; Marketing – main tasks; the marketing concept vs other basic concepts in Industrial Management; Understanding the Market Environment – marketing research; Marketing segmentations, understanding customers buying behavior; Marketing positioning - the marketing mix.

PREREQUISITES: Economics.

TEACHING METHODS: Lectures and seminars with multi-media presentations, case studies, business situation simulations, test exercises.

METHOD OF ASSESSMENT: Control Pre-test during the semester (20%) and Final Exam Test (80%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1.Olha Mezentseva, Maksym Bezpartochnyi and Valentina Marchenko, Fundamentals of Management for Enterprises. Textbook for beginners, VUZF University of Finance, Business and Entrepreneurship Publishing House ―St. Grigorii Bogoslov, 2020; 2. A.P.Verma and N.Mohan, Text Book of Industrial Management, S K Kataria, ISBN 978-9350144930, 2015; 3. Stephen P. Robbins, David A. DeCenzo, Mary Coulter; Fundamentals of Management: essential concepts and applications; Pearson Education, Inc., 2013; 4. Tony Morden, Principles of Management, Routledge, 2021; 5. William Perreault, Joseph Cannon, E. Jerome McCarthy BASIC MARKETING: A Marketing Strategy Planning Approach, 19th Edition, McGraw-Hill Irwin, ISBN13: 9780078028984, 2014; 6. Jeanette McMurtry, Marketing For Dummies, Wiley , ISBN: 978-1-119-36557-0, 2017.

DESCRIPTION OF THE COURSE

Name of the course: **Operations Research**	Code: **BpIEe34**	Semester: 4
Type of teaching: Lectures (L) Seminars (S)	Hours per semester: L – 26 hours S – 15 hours	Number of credits: 4

LECTURER(S):

Assoc. Prof. Vasil Petrov, PhD (FME) , tel.: 032 659 680 email: 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: The students get familiar with the basic methods and algorithms in Operations Research, and their applications in engineering and management.

DESCRIPTION OF THE COURSE: Main topics: *Network models and algorithms:* minimum spanning tree, shortest path problems, Chinese postman problem, maximum flow – Ford-Fulkerson algorithm, PERT and CPM models; *Linear programming*: statement of the basic problem, graphical solution in the case of two variables, simplex method, the M-technique, transportation problem; *dynamic programming*.

PREREQUISITES: Linear algebra (Mathematics 2 (BpIEe10)), Graph theory.

TEACHING METHODS: Lectures and Seminars.

METHOD OF ASSESSMENT: The assessment is based on several written homeworks, done during the semester.

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY:

1. Dieter Jungnickel, Graphs, Networks and Algorithms, Springer, 2nd ed., 2005

2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th ed., 2018 .

3. L. R. Foulds, Combinatorial optimization for undergraduates, Springer, 1984
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DESCRIPTION OF THE COURSE

Name of the course: **Industrial Practice**	Code: **BpIEe35**	Semester: **4**
Type of teaching: Lectures(L) Laboratory work (LW))	Hours per semester: L – 0 hours LW – 0 hours	Number of credits: **1**

LECTURER(S):

Assoc. Prof. Radoslav Hrischev, PhD tel.: 032 659525, e-mail: hrischev@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 acquaint students with real production, including the organization of the enterprise, marketing, human resources, company policy, technological processes, control systems and automation.

DESCRIPTION OF THE COURSE: Introduces students to different types of production. To achieve this goal, visits to various successfully operating public and private enterprises and laboratories. During the visits the students can understand how the companies working in a real Bulgarian market economy work. They can learn details about the subject, the organization of work, the company's policy and the motivation of the staff working in it. They can see different types of production organization, technological processes, machines, systems automation.

PREREQUISITES: Industrial management, Introduction to production.

TEACHING METHODS: Visiting production companies and lectures. Visit reports.

METHOD OF ASSESSMENT: Current assessment based on submitted reports.

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1. Timings R. L. and S. P. Wilkinson, Manufacturing Technology: volume 2, Second Edition, Pearson Education Ltd., 2000, 2. Andrew Y. C. Nee – editor Handbook on Manufacturing Engineering and Technology, Springer – Verlag London 2015, 3. Helmi A. Youssef, Hassan A. El-Hofy, Mahmoud H. Ahmed Manufacturing Technology: Materials, Technology, and Equipment, CRC Press, 2011.,

<div align="center">**DESCRIPTION OF THE COURSE**</div>

Name of the course: **Sport**	Code: **BpIEe37**	Semester: 4
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 Vladimdirov, PhD (FEA), tel.: 032 659 646, e-mail: danielv@tu-plovdiv.bg
Sen. Lect. Petar Doganov, PhD (FEA), tel.: 032 659 648, e-mail: pdoganov@tu-plovdiv.bg
Sen. Lect. Boris Spasov, PhD (FEA), tel.: 032 659 647, e-mail: boris_spassov@tu-plovdiv.bg
<div align="center">Technical University of Sofia-Branch Plovdiv
Technical University of Sofia</div>

COURSE STATUS IN THE CURRICULUM: Compulsory subject from the curricula for training of students to obtain Bachelor's degree, specialties "INDUSTRIAL ENGINEERING in English", Professional orientation 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 and "Pass grade".

INSTRUCTION LANGUAGE: Bulgarian

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