DESCRIPTION OF THE COURSE

Name of the course **Control Theory II**	Code: **BpAICE32**	Semester: **5**
Type of teaching: Lectures and laboratory work Course Work	Lessons per week: L – 2 hours; LW – 2 hour	Number of credits: **6**

LECTURER:
Prof. Ph.D. B. Penev (FEA), Assist. prof. Ph.D V. Petrov Technical University Sofia, Branch Plovdiv, Faculty of Electronics and Automatics (FEA), Control Systems Department

COURSE STATUS IN THE CURRICULUM: Compulsory discipline for regular Bachelor students in the specialty "Automatics, Informatics and Control Engineering" (BAICE) of FEA, Technical University Sofia, Branch Plovdiv.

AIMS AND OBJECTIVES OF THE COURSE: To give the students knowledge and skills in analysis and design of continuous and discrete linear control systems necessary for the following disciplines in the studying period, in the course and diploma work, as well as in their work as control engineers after graduation.

DESCRIPTION OF THE COURSE: In the course "Control theory II" the students study linear control theory including analysis and design of continuous and discrete linear control systems, description of linear systems by differential and difference equations, transfer functions, frequency and time responses, description of single and multivariable continuous and discrete systems in state space; connections between different mathematical descriptions; analysis of the performance quality specifications; fundamental properties controllability, observability, stability and the respective criteria; linear system design by pole assignment; linear observer design; methods for transition matrix computation; methods for digitization of continuous systems; linear system design by quadratic criteria.

PREREQUISITES: The course uses knowledge from the following disciplines: "Mathematics I, II, III, IV", "Pulse and digital circuits", "Theoretic Electrotechnics I, II", Technical Mechanics", "Physics I, II", "Control theory I".

TEACHING METHODS: Lectures including case studies, laboratory work with transactions, course work, team work, private work. In the laboratory and course work the students acquire skills in analysis, design and investigation of linear control systems. The course work includes analysis, design and simulation of a definite linear system using computers with Microsoft Windows, Microsoft Office, MATLAB, SIMULINK and MATLAB TOOLBOXES.

METHOD OF ASSESSMENT: Course work defense (15%), laboratory work transactions (5%) and written examination at the end of 5th semester including a task and two topics from the syllabus (80%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1. Маджаров Н., Въведение в съвременната теория на автоматичното управление, Част 1 (Анализ), Техника, София, 1982; 2. Томов И., Въведение в съвременната теория на автоматичното управление, Част 2 (Синтез), Техника, София, 1984; 3. Велев К., Теория на автоматичното управление, Мартилен, София, 1993; 4. Astrom K., B. Witenmark, Computer-controlled systems, Theory and design, Second Edition, Prentice-Hall International, Inc., 1990; 5. Kailath T., Linear Systems, Prentice Hall Professional Reference, 1996; 6. Изерман, Р., Цифровые системы управления, "Мир", Москва; 7. Strejc, V., State Space Theory of Discrete Linear Control, ACADEMIA, Prague, 1981;

Description of the course

Name of the course: **Technical devices for automation**	Code:**BpAICE33 BpAICE34**	**Semester:5**
Type of teaching: **Lectures and Laboratory work, Course project**	Lessons per week:L-2 hours; LW- 2 hours	**Number of credits:5**

LECTURER:

Assoc. Prof. Ph. D. Krum Kutryanski Technical University of Sofia, Branch at Plovdiv /FEA

COURSE STATUS IN THE CURRICULUM:

The subject is compulsory for students regular course specialty "Automatics, Information and Control Engineering" for educational- qualification level "bachelor".

AIMES AND OBJECTIVES OF THE COURSE:

The aim of the course is to develop engineering-applied way of thinking of students, which is required for means of automation.

DESCRIPTION OF THE COURSE:

The main topics concern: Basic equations and characteristics of linear laws for control. Transfer function, transitive function and frequency characteristics of P, I, PI, PD and PID controllers. Basic equations and characteristics of discrete laws for control. Two-points, tree-points and multi-points regulators. Controller with constant speed. Review of basic pneumatic elements. Discrete pneumatic automatics. Schemes with operating amplifier which realize types of dynamical units and laws for control. Digital controllers. Programming realizations of type units and basic laws of control.

PREREQUISITES:

Control Theory, Electrical Engineering, Electronics, Electrical drives.

TEACHING METHODS:

Lectures, laboratory works with reports.

METHODS OF ASSESSMENTS:

Written exam in the end of fifth semester. Discussion on the course project in the end of the fifth semester.

INSTRUCTION LANGUAGE:

Bulgarian

BIBLIOGRAPHY:

1. Драготинов И., Кр. Кутрянски, Ж. Стойчев, Г. Терзийски, Технически средства за автоматизация, Академично издателство на УХТ - Пловдив, 2015.

2. Николов Е., Технически средства за автоматизация, II част, ТУ-София, 2003.

3. Костов К., Е. Николов, Технически средства за автоматизация, ВМЕИ, София, 1988.

4. Гарипов Е., Цифрови системи за управление, I част, Проектиране на ПИД регулатори, ТУ-София, 2004.

DESCRIPTION OF THE COURSE

Name of the course: **Microprocessor systems**	Code: **BpAICE35**	Semester: 5
Type of teaching: Lectures and laboratory work, course work .	Lessons per week: L – 2 hours; LW – 2 hour	Number of credits: **5**

LECTURERS: Prof. PhD Grisha Spasov (FEA), tel.: 659 724/576, email: gvs@tu-plovdiv.bg, and Assoc. prof. PhD Sevil Ahmed (FEA), tel.: 659 585, e-mail: sevil.ahmed@tu-plovdiv.bg Technical University of Sofia, branch Plovdiv

COURSE STATUS IN THE CURRICULUM: Compulsory for the students specialty "Automation, Information and Control Engineering" B.Sc. programme of the Faculty of Electronics and Automatics, Technical University of Sofia, branch Plovdiv.

AIMS AND OBJECTIVES OF THE COURSE: At the end of the course the students have to know the basics of microprocessor systems and their applications in automations, control systems and intelligent measurement systems. Architecture of PC based microcomputers, PC interfaces, development of input/output drivers.

DESCRIPTION OF THE COURSE: The main topics concern: Introduction in CPU organisation and operation. Pentium/x86 architecture: programming model, registers, memory models, addressing modes, instructions. Assembler for 80x86, simple assembly programming. Pentium/x86 interrupt model. Input and output: device types and characteristics, controllers, ports, programmed I/O, interrupts, DMA. Bus structure: ISA, PCI, chipsets. I/O Interfaces RS232, RS485, Centronics and USB. Development of simple device drivers. Embedded systems – architecture and programing.

PREREQUISITES: Basic knowledge in the area of Pulse and digital electronics.

TEACHING METHODS: Lectures, using slides and multimedia presentations, laboratory work, using demo-programs, course work .

METHOD OF ASSESSMENT: Written exam with test on the theory and written work on problems. The final grade is constructed on the exam results (totally 90%) and the protocols from the laboratory work (10%).

INSTRUCTION LANGUAGE: Bulgarian.

BIBLIOGRAPHY: 1. Fulcher. An introduction to Microcomputer Systems Architekture and interfacing, ADDISON-WESLY 1991; 2. Hans-Peter Messmer. The Indispensable PC Hardware Book. ADDISON-WESLY 2002; 3. KIP R. IRVINE, "Assembly Language for x86 Processors", Sixth Edition, Pearson Higher Education 2011, ISBN-13: 978-0-13-602212-1; 4. Г. Спасов, М. Шопов, В. Спасова, Н. Каканаков "Ръководство за лабораторни упражнения по Микропроцесорни системи", ТУ София, ISBN: 978-619-167-021-5, 2013; 5. Klaus Dembowski. PC Interfaces and System Buses. Pearson Education Deutschland GmbH 2001.

DESCRIPTION OF THE COURSE

Name of the Course: **Measurement of Nonelectrical Quantities**	Code: **BpAICE36**	Semester: 5
Type of teaching: Lectures, Laboratory work, Self Study.	Lessons per week: L-2 hours; LW-2 hours; SS-4 hours;	Number of credits: **5**

LECTURER:
Assoc. Prof. Dr. Nikola Georgiev, TU-Sofia, Plovdiv Branch, Faculty of Electrical Engineering and Automation; Department of Electrical Engineering; Address: 25 Tsanko Dyustabanov Str., Phone: (032) 659-581, e-mail: nikola.georgiev@tu-plovdiv.bg

COURSE SATUS IN THE CURRICULUM. Compulsory discipline for regular Bachelor students in the specialty "Automatics, Informatics and Control Engineering" (BAICE) of FEA, Technical University Sofia, Branch Plovdiv.

AIMS AND OBJECTIVES OF THE COURSE. The subject aims at introducing students to the theory of Measurement Nonelectrical quantities and the basic technical quantities

COURSE DESCRIPTION. Basic topics: methods and devices for measurement of force, pressure , temperature, flow and moving. These basic quantities measure with sensors which transform them in electric signal.

PREREQUISITES. The course of lectures and laboratory work is based on the students' knowledge of Mathematics, Physics and Theoretical Electrical Engineering – part 1 and 2.

TEACHING METHODS. Lectures. Laboratory work carried out following a lab guide with reports worked out by the students and defended at classes before the lecturer.

METHOD OF ASSESSMENT. Written examination at the end of the fifth semester.

INSTRUCTION LANGUAGE: Bulgarian.

BIBLIOGRAPHY.
1. Nakta B.C., K. K. Chaudhry "Instrumentation Measurement and Analis", McGraw Hill Publishingh Compani Limited, 1990. 2. Левишина Е. С., П. В. Новицкий, "Електрически измерения физических велечин", М. , Энергия, 1983. 3. Ж. Аш, "Датчики измерителых систем", М., Мир, 1992. 4. П. П. Кремлевский, "Разходомеры и счетчики количества,Л., Машиностроене, 1989. 6. Костов Ж. Г., Е. К. Николов, Технически средства за автоматизация, С., ВМЕИ, 1988.

DESCRIPTION OF THE COURSE

Name of the course: **Data and signal processing**	Code: **BpAICE37**	Semester: 5
Type of teaching: Lectures, Laboratory work, Private work	Lessons per week: L-2 hours; LW-2 hours; PW-4 hours;	Number of credits: **5**

LECTURERS. Assoc. Prof. PhD. Sevil Ahmed, Technical University Sofia, Branch Plovdiv, Faculty of Electronics and Automatics (FEA), Control Systems Department, Phone: 032 659585, Email: sevil.ahmed@tu-plovdiv.bg

COURSE SATUS IN THE CURRICULUM. Compulsory discipline for regular Bachelor students in the specialty "Automatics, Informatics and Control Engineering" (BpAICE) of FEA, Technical University Sofia, Branch Plovdiv.

AIMS AND OBJECTIVES OF THE COURSE. The course teaches the students computer matrix-vector calculations, analysis, design, and simulation of dynamical systems and filters, applications of the Laplace and Fourier transformations, correlation and statistical data and signal processing. It aims to familiarize students with the methods and algorithms for digital signal processing, as well as the features and applications of signal processors.

COURSE DESCRIPTION. Students acquire knowledge of the basic methods of digital data and signal processing, as well as knowledge of the features and applications of signal processors in the field of signal processing and control systems. Central in the course are the analysis, design, modeling, and simulation of continuous and discrete dynamic systems and filters, correlation and statistic data and signal processing methods, the Signal Processing Toolbox.

PREREQUISITES. The course uses knowledge from the following disciplines: "Higher Mathematics I, II, III", Programming and computer systems applications I, II", "Microprocessor systems", "Control Theory 1", "Control Theory 2", "Theoretic Electrotechnics I, II", "English language".

TEACHING METHODS. Lectures with multimedia, laboratory work with transactions, team work, private work. In the laboratory exercises the students acquire skills in computer analysis, design, and simulation of dynamical systems and filters for data and signal processing with the software products MATLAB, SIMULINK and MATLAB TOOLBOXES.

METHOD OF ASSESSMENT. One-hour assessment work at the end of the semester.

INSTRUCTION LANGUAGE: Bulgarian.

BIBLIOGRAPHY.
1. Ружеков Г., Обработка на данни и сигнали. Второ преработено и допълнено издание, ТУ София, 2011 (in Bulgarian); **2.** Ружеков Г., Ръководство за лабораторни упражнения по обработка на данни и сигнали, ТУ София, 2009 (in Bulgarian); **3.** MATLAB User's Guide, The Math Woks, Inc. 1993; **4.** MATLAB Reference Guide, The Math Works, Inc. 1992; **5.** SIMULINK User's Guide, The Math Works, Inc. 1993; **6.** Control systems Toolbox User's Guide, The Math Works Inc. 1992; **7.** Optimization Toolbox User's Guide, The Math Works Inc. 1992; **8.** System Identification Toolbox User's Guide, The Math Works Inc. 1992; **9.** Signal Processing Toolbox User's Guide, The Math Works Inc. 1992; **10.** Statistics Toolbox User's Guide, The Math Works Inc. 1993; **11.** Гарипов Е. М., Решени задачи по проектиране на системи за управление в MATLAB и SIMULINK, ТУ София, 1999 (in Bulgarian); **12.** Маджаров Н., Стохастични процеси в системите за управление, ТУ София, 1993 (in Bulgarian); **13.** Мишков Р., Линейни системи за управление, Лабораторни упражнения, Пловдив, 20062011 (in Bulgarian); **14.** Мишков Р., Нелинейни системи за управление, Лабораторни упражнения, Пловдив, 20062011 (in Bulgarian); **15.** Ненов Г., Сигнали и системи, София, 1999 (in Bulgarian)

DESCRIPTION OF THE COURSE

Name of the course: **Engineering laboratory practice**	Code: **BpAICE38**	Semester: **5**
Type of teaching: Lectures, Laboratory work, Self study	Lessons per week: L – 1 h, LW – 2 hours, SS – 2 h.	Number of credits: **3**

LECTURER: Assoc. Prof. PhD. Nikola Shakev, Control Systems Department, Technical University Sofia, Branch Plovdiv, Faculty of Electronics and Automatics (FEA), Phone: 032 659528, Email: shakev@tu-plovdiv.bg.

COURSE STATUS IN THE CURRICULUM: Compulsory for the students specialty "Automatics, Information and Control Engineering" BEng programme of the Faculty of Electronics and Automatics

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is the accumulation of practical engineering skills in working with passive and active electrical elements, analog integrated circuits, operating with electric motors.

DESCRIPTION OF THE COURSE: The course provides practical knowledge and skills for practical work with passive elements – resistors, capacitors, inductors etc., utilization peculiarities; discrete semiconductor elements – diodes, transistors, basic parameters, typical schematic solutions; analog integrated circuits, operational amplifiers, comparators, stabilizers, timers etc., basic parameters – typical circuits; Analysis and design of passive and active filters with RLC elements and analog integrated circuits; implementation of P, PI, PID regulators with analog integrated circuits, typical schematics, basic parameters and tuning.

PREREQUISITES: Physics, Theoretical Electrotechnics, Mechanics, Programming and computer systems, Semiconductor electronics, Pulse and digital circuits, Electromechanical devices, Control theory, Electrical measurements, Technical automation tools, Microprocessor technics, Nonelectrical measurements, Data and signal processing, English language.

TEACHING METHODS: Lectures using multimedia, laboratory work using analog modeling devices, computer simulation, electrical circuits, operation with electric motors, work in teams, protocols.

METHOD OF ASSESSMENT: Assessment work in the end of V-th semester.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:

1. Chen, C-T., Analog & Digital Control System Design, Oxford University Press, 1993;

2. Analog devices – catalogue data and data sheets;

3. SIEMENS – catalogue data and data sheets;

4. Lenk J., Operational amplifiers manual, Tehnika, 1991 (in Bulgarian);

5. Gottlieb I., Power Supplies, Switching Regulators, Inverters and Converters, TAB Books, 1994, ISBN 5-901095-05-7;

6. Valkov S., Analog electronics, Tehnika, 2002 (in Bulgarian);

7. Sokloff S., Applications of analog integrated circuits, Tehnika, 1990 (in Bulgarian);

COURSE DESCRIPTION

Name of the course: **Systems Identification**	Code: **BpAICE39**	Semester: **6**
Type of the education: Lectures, Laboratory exercises.	Hours during the week: Lectures – 2 hours, Lab. exercises – 2 hours.	Credits: **6**

INSTRUCTOR:
Professor Andon V. Topalov (FEA), phone: 659 528, email: topalov@tu-plovdiv.bg
Technical University – Sofia, branch at Plovdiv

STATUTE OF THE COURSE IN THE CURRICULUM: This is a compulsory course for the students from the specialization "Automation, information and control engineering", qualification degree in education "bachelor".

GOALS OF THE COURSE: When the process is complex, or the information about many process variables is missing it is difficult to derive its appropriate dynamic model using only analytical modeling. In such conditions the only feasible way for building it is based on conducted experiments: the input and output signals of the system under consideration are measured and appropriately processed in order to obtain the model describing their transformation. This approach is known as system identification. At the end of the course students will be able to apply successfully different engineering techniques in order to obtain the mathematical models of the dynamics of different continuous and discrete systems.

COURSE DESCRIPTION: The fundamental and widely used methods for identification of mainly linear dynamic systems are studied. Different non-recursive and recursive techniques for plant parameter estimation in open and closed loop are discussed. Attention is paid to the quality of the obtained estimates (they have to be non-shifted, consistent etc.) and to the approaches for estimation that can guarantee these properties. The problems of choosing appropriate structure of the model and good conditions for conducting the experiments are also considered, the existing criteria for model validation are described. The theoretical preconditions for linking the parameter estimation task with the task for state estimation using Kalman filters are given. The place of system identification (and of the recursive estimators in particular) in adaptive control schemes with self tuning regulators is given.

PREREQUISITES: „Automatic control theory - part I and II", „Automation of technological processes".

TEACHNG METHOD: Lectures, laboratory exercises with written reports.

GRADING: Two hours written exam during the examinations (82%), laboratory exercises (18%).

LANGUAGE OF TEACHING: Bulgarian

REFERENCE TEXTS: 1. E. Garipov, Identification of systems, part1 and part2, TU Sofia, 2007 (in Bulgarian). 2. I. Vuchkov, Identification, IK IUrapel, 1996 (in Bulgarian). 3. V. Tsochev, Handbook of laboratory exercises on identification, Artform, 1996 (in Bulgarian). 4. L. Ljung, System Identification: Theory for the User, 2nd ed., NJ: Prentice Hall PTR, 1999. 5. T. Petkov, Identification of controlled plants, Technika, 1982 (in Bulgarian).

DESCRIPTION OF THE COURSE

Name of the course **Process Control**	Code: **BpAICE40** **BpAICE41**	Semester: **6**
Type of teaching: Lectures (L) Laboratory work (LW) Course project (CP)	Lessons per week: L – 2 hours; LW – 2 hours	Number of credits: **5+1**

LECTURER:
assoc. prof. Ivan Ganchev, Ph.D., e-mail: ganchev@tu-plovdiv.bg
(FEA), Control Systems Department, Technical University - Sofia, Branch Plovdiv

COURSE STATUS IN THE CURRICULUM: Compulsory for the B.Eng level students, speciality AICE of the Faculty of Electronics and Automation.

AIMS AND OBJECTIVES OF THE COURSE: After studying this course the students should be able to apply methods for investigation and analysis of industrial plants, to choose the appropriate structure of the control system and provide optimal tuning of the controllers.

DESCRIPTION OF THE COURSE: The main topics concern: Plant Models in Process Control, Analysis of Systems with different Controllers, Methods for optimal tuning of Controllers, Cascade control Systems, Time Delay Systems, Multiple-Input Multiple-Output Systems, Applied aspects of Process Control, Automatic tuning of controllers , etc.

PREREQUISITES: Control Theory, Instrumentation for Control, System Identification, Computer Simulation.

TEACHING METHODS: Lectures, handouts, laboratory work using industrial controllers, modeling and simulations using MATLAB/Simulink, written reports on the laboratory work. Individual course project.

METHOD OF ASSESSMENT: Two-hour assessment at the end of the semester (100%). The course project has a separate assessment.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1. Dragotinov I., I.Ganchev, Process Control, *Third edition*, University of Food Technologies, Plovdiv, 2013. **2**. Dragotinov I., I.Ganchev, Process Control, University of Food Technologies, Plovdiv, 2003. **3**. Hinov H., K.Naplatarov, Process Control, Technika, Sofia, 1987. **4**. Hadjiiski M., Process Control in Metallurgy and Chemistry, Technika, Sofia, 1992. **5**. Hadjiiski M., K.Velev, G.Sotirov, I.Kalaykov, Process Control - Methods and Algorithms, Technika, Sofia, 1992, **6**. Astrom K-J, T. Hagglund, PID Controllers: Theory, Design, and Tuning, Instrument Society of America, Research Triangle Park, 1995. **7**. Golten J., A.Verwer, Control System Design and Simulation, McGraw-Hill, 1991, **8**. Luyben W., M.Luyben, Essentials of Process Control, McGraw-Hill, 1997

DESCRIPTION OF THE COURSE

Name of the course: **Control of Electromechanical Systems**	Code: **BpAICE42**	Semester: **6**
Type of teaching: Lectures (L) Laboratory work (Lab.) Semester assignment (SA)	Lessons per week: L – 2 hours, Lab. – 2 hours	Number of credits: **5**

LECTURER: Assoc. Prof. PhD. Ivan Kostov (FEA) – tel.: +35932659526, email: ijk@tu-plovdiv.bg , Technical University - branch Plovdiv.

COURSE STATUS IN THE CURRICULUM: Compulsory subject for full-time students of the Automation, Information and Control Engineering specialty at FEA of TU-Sofia, Plovdiv Branch, Bachelor's degree.

AIMS AND OBJECTIVES OF THE COURSE: Students acquire knowledge about basic types of electric drives learning their principles of operation, respective structures, mathematical descriptions, transfer functions, control algorithms and performance.

DESCRIPTION OF THE COURSE: Topics covered include: Rectifier control of DC motors (two-quadrant and four-quadrant systems); Chopper control of DC motors (one-quadrant, two-quadrant and four-quadrant systems); Control of induction motors by AC voltage controllers; Frequency-controlled induction motor drives (systems with cycloconverters, voltage source inverters and current source inverters); Slip-power controlled wound-rotor induction motor drives; Control of synchronous motor electromechanical systems; Brushless DC and AC motor drives; Control of stepping motor electromechanical systems.

PREREQUISITES: Electromechanical Devices, Pulse and digital scheme technique, Measurement of Non-electrical Quantities, Control Instrumentations, Control Theory.

TEACHING METHODS: Lectures visually illustrated, Laboratory work with protocols preparation, Course work.

METHOD OF ASSESSMENT: Final written exam.

INSTRUCTION LANGUAGE: Bulgarian.

BIBLIOGRAPHY:
1. Михов, М. Р., Управление на електромеханични системи, част I, Технически университет - София, София, 2011; 2. Михов, М. Р., Управление на електромеханични системи, част II, Технически университет - София, София, 2011; 3.Михов, М. Р., Ръководство за курсова работа по управление на електромеханични системи, Технически университет - София, София, 2011; 4. Shepher, W., L. N. Hulley, Power electronics and motor control, Cambridge University Press, Cambridge, 1987; 5. Dubey, G. K., Power semiconductor controlled drives, Prentice Hall, New Jersey, 1989; 6. O'Kelly, D., Performance and control of electrical machines, Cambridge University Press, Cambridge, 1991; 7. Bose, B.K., Power electronics and motor drives: advances and trends, Academic Press, London, 2006. 8. Кутрянски К., И Костов, Г. Даскалов, Управление на електромеханични системи - ръководството за лабораторни упражнения, Технически университет, филиал Пловдив, Пловдив, 2001. 9. Костов И., Електрозадвижване, учебно пособие, ТУ-Филиал Пловдив, 2007, с.200. 10. Костов И., Електромеханични системи, учебно пособие, ТУ София, ф-л Пловдив, 2010г. 11. Leonhard W., Control of electrical drives, Springer, 3rd ed., ISBN 3-540-41820-2, 2001, pp.600.

12. http://dox.bg/files/dw?a=de9581a1a66

DESCRIPTION OF THE COURSE

Name of the course: **Communication Systems in Integrated Industries**	Code: **BpAICE43**	Semester: **6**
Type of teaching: Lectures (L) Laboratory work (LW)	Lessons per week: L – 2 hours LW – 2 hours	Number of credits: **4**

LECTURER: prof. Ph.D. Michail Petrov, tel.: 659 555, email: mpetrov@tu-plovdiv.bg
assoc. prof. Ph.D. Albena Taneva, tel.: 659 585, email: altaneva@tu-plovdiv,.bg
(FEA) Technical University of Sofia, branch Plovdiv

COURSE STATUS IN THE CURRICULUM: Compulsory for the student's specialty Control Engineering of Faculty Electronics and Automation, bachelor degree

AIMS AND OBJECTIVES OF THE COURSE: At the end of the course the students are expected to be able apply the modern concepts for networking. The students should be introduced to the concepts for intelligent systems interconnection, an be able to solve problems with designing open architecture systems for communication.

DESCRIPTION OF THE COURSE: The main topics concern: Introduction. Communication model. Protocols and architectures. Standards. Mediums for data transmission. Analog and Digital communication. Wired and wireless data communication. Coding. Analog and digital data. Communication interfaces. Synchronous and asynchronous communication. Data-link control. Multiplexing. Chanel switching and packet switching. Routing. Signaling. Frame relay and ATM. Architecture of frame relay. Network functions and collision detection. ATM cells. LAN technologies. Topologies. Ethernet. Token ring. Optical channels. Bridges. TCP/IP protocols. Internetworking. Datagrams. Network security. Public key encryption. Applications in integrated systems. Network control. ISDN.

PREREQUISITES: Programming and Computing, Control Theory, Electrical Engineering, Digital Systems, Data and Signal Processing.

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

METHOD OF ASSESSMENT: Exam (70%), laboratories (30%).

INSTRUCTION LANGUAGE: Bulgarian.

BIBLIOGRAPHY:

1. Джиев, Ст., (2003), Индустриални мрежи за комуникация и управление., Изд. ТУ, С., 2003.
2. Сапунджиев, Г., (1993), Интегрирани системи за управление на производството. Изд. ТУ, С., 1993.
3. Христов Х., Мирчев С., Неделчев Н., (2001), Основи на телекомуникациите мрежи, Нови Знания, София, 2001, ISBN 954-97-40-35-8.
4. W. Stallings, (2006), Data and computer Communications; Prentice Hall Inc., New Jersey, 2006, ISBN 0 132 4331 09.
5.KNAPP, ERIC D. Industrial Network Security - Securing Critical Infrastructure Networks for Smart Grid, SCADA, and Other Industrial Vontrol Systems, издател SYNGRESS MEDIA,U.S. 2011, ISBN 978-1-59749-645-2 (pbk.) 2011 Elsevier Inc.
6.David P. Buse, Q.H. Wu, IP Network-based Multi-agent Systems for Industrial Automation: Information Management, Condition Monitoring and Control of Power Systems (Hardcover) ISBN 978-1-84996-635-1, Springer-Verlag London Limited 2010

COURSE DESCRIPTION

Name of the course: **Artificial Intelligence and Robotics**	Code: **BpAICE44**	Semester: **6**
Type of the education: Lectures, Laboratory exercises.	Hours during the week: Lectures – 2 hours, Lab. exercises – 2 hours.	Credits: **4**

INSTRUCTOR: Assoc.Prof. Nikola Shakev, PhD, phone (032) 659 528, Technical University of Sofia- branch Plovdiv, Faculty of Electronics and Automation.

STATUTE OF THE COURSE IN THE CURRICULUM: This is a compulsory course for the students from the specialization "Automation, information and control engineering", qualification degree in education "bachelor".

GOALS OF THE COURSE: Understanding the essential principles of intelligent behavior, corresponding computational algorithms, and ideas for building practical applications of intelligent systems in Automation and Robotics. Getting working knowledge and skills in knowledge representation, reasoning, and architectures to design simple intelligent agents for diagnostic, decision support and control systems. The content of learning material is consistent with the fundamental knowledge of students.

COURSE DESCRIPTION: BAICE44 is an introductory course for the field Artificial Intelligence (AI). It offers modern knowledge, consistent with the required professional competencies and trends in specialty AICE, in medium and long term. The area is represented from the position of agent-oriented approach to AI - rational behavior of systems. From this perspective the relationship between AI and Robotics is represented, which is to build software architectures and mechanisms for integration of reasoning, perception and action of agents able to solve specific tasks in real physical environments. The main covered topics include: Intelligent agents, environments and behaviors. Principle of rationality, rational reasoning and rational acting. Formal logic methods for knowledge representation and reasoning in intelligent systems. Problem solving by searching – informed and heuristic search methods. Acting logically – planning methods. Learning. Uncertain knowledge and reasoning. Robotics and AI – intelligent connection of perception to action.

PREREQUISITES: „Automatic control theory - part I and II", „Automation of technological processes".

TEACHNG METHOD: The basic didactic approach "understands trough implementation". Multimedia presentations for lectures, computer tests, homework and discussions in teamwork are used. For laboratory, a set of suitable simulation environments, prototype computer programs handouts for working with real robots I-robot Create. We also use our own materials for control of robots in the program environment of Matlab and Simulink. The course application focus is on the use of AI algorithms in the deliberative and reactive architectures in robotics and automation..

GRADING: Two hours written exam during the examinations (80%), laboratory exercises (20%).

LANGUAGE OF TEACHING: Bulgarian

REFERENCE TEXTS: 1. Д. Димитров, Д. Никовски. *Изкуствен интелект*. Второ преработено издание. ISBN 954-438-252-6. Изд. ТУ-София, 1999.
2. Д. Димитров. *Системи с интелигентно поведение*. ТУ-София,2005,ISBN 954438-457-Х. 3. Д. Димитров. *Логическо моделиране и програмиране (Пролог)*. ТУ-София, 2005, ISBN 954-438-458-8. 4. S. Russel., P. Norvig. *Artificial Intelelgence. A Modern Approach*. Prentice Hall, 2010. 5. R. Siegwart, I. Nourbakhsh. *Introduction to Autonomous Mobile Robots*. Massachusetts Institute of Technology, 2004.

DESCRIPTION OF THE COURSE

Name of the course: **Quality Management and Control**	Code: **BpAICE45**	Semester: **6**
Type of teaching: Lectures (L) Laboratory Work (LW)	Lessons per week: L - 2 hours LW - 2 hours	Number of credits: **5**

LECTURERS:

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prof. Ph.D. Michail Petrov (FEA), tel.: 659 585, email: mpetrov@tu-plovdiv.bg
Technical University of Sofia, branch Plovdiv

COURSE STATUS IN THE CURRICULUM: Mandatory for all students in the Automation Information and Control Engineering BEng program of the Faculty of Electronics and Automation at the Technical University of Sofia, branch Plovdiv.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is: the students to acquire the base concepts and modern methods, tools and structures of Quality Management. The students gain knowledge on the systems for quality management and control, as well as knowledge and skills to solve specific engineering problems for the quality control: the basement of the statistical quality control and statistical technology process control; methods for creation of control charts for quantitative and qualitative indices; acceptance statistical control (inspection) and determining of the sample volume of a batch according to pre-defined quality indicators.

DESCRIPTION OF THE COURSE: The subject of the course are the management systems and the engineering methods, tools and approaches to the quality control of production and services, as well as the actions related with improving of the organization of the production in all its aspects. The students will be fluently orientated in the national and international systems and societies of quality management and control; they will manage the optimal engineering approaches for sustainable achieving of high quality; they will be able to define criteria values, to manage the respective conformity assessment processes and to take the respective decisions in quality improvement aspect.

PREREQUISITES: Mathematics, Physics, Electrical Measurements, Measurement of NonElectrical Values

TEACHING METHODS: Lectures, using slides, laboratory works with implementation of specialized software with final reports, made by the students and revised by the teacher; Tasks and tests for current control.

METHOD OF ASSESSMENT: Current control rating at the end of the semester includes: current theory tests - 2 separate tasks by 35%, 70% totally, Laboratory tasks assessment 30%

INSTRUCTION LANGUAGE: Bulgarian.

BIBLIOGRAPHY:

1. **Дюкенджиев Г., Р. Йорданов,** Контрол и управление на качеството. Софтрейд, София, 2012.
2. **Станчева В. Й., К. Я. Киров, Н. П. Стефанов,** Управление на качеството. QM, Варна, 1995.
3. **Besterfield, D.,** Quality Control, Prentice Hall, 1986.
4. **Crosby, P.,** Quality is Free, McGraw-Hill Book Company, 1984.
5. **Doming, W.,** Quality, Productivity, and Competitive Position, MIT, 1982.
6. **Juran, J.,** Quality Control Handbook, MeGraw-Hill Book Company, 1974.
7. **Hoyle, D.,** ISO - 9000 Quality Systems Handbook, Butterworth-Heinemann Ltd., 1994.