DESCRIPTION OF THE COURSE

Name of the course **Control Theory I**	Code: **MpAICE21**	Semester: **1**
Type of teaching: Lectures, laboratory work, Course work	Lessons: L – 30 hours; LW – 30 hour	Number of credits: 5

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 course for the students of "Automatics, Informatics and Control Engineering", additional or compensatory training for Master's Engineering degree.

AIMS AND OBJECTIVES OF THE COURSE: To give the students basic knowledge and skills in analysis and design of continuous 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 I" the students study mathematical models of linear systems by differential equations and transfer functions based on Laplace transformation, main control laws, frequency characteristics of linear systems based on Fourier transformation, algebraic and frequency stability analysis as well as performance specifications of linear systems.

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", "

TEACHING METHODS: Lectures including case studies, laboratory work with transactions, team work, private work. In the laboratory 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: laboratory work transactions (5%) and written examination at the end of 4th semester including a task and two topics from the syllabus (95%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY: 1. Ищев, К., Теория на автоматичното управление.София, КИНГ, 2000; 2. Наплатанов, Н. и др. Въведение в теорията на управлението. ВМЕИ, С., 1987; 3. Наплатанов, Н., Основи на техническата кибернетика, т.1: Теория на автоматичното регулиране. С., Техника, 1976; 4. Dorf, R.C., Modern Control Systems. Addison-Wesley Publishing Company, 1989; 5. Saadat, H., Computational Aids in Control Systems Using MATLAB. McGraw-Hill, 1993.

DESCRIPTION OF THE COURSE

Course title: **Electrical measurements**	Code: **MpAICE22**	Semester: **1**
Type of teaching: Lectures laboratory exercises	Hours: L - 30 hours; LE - 30 hours.	number of credits: 5

LECTURER: Associate Professor,PhD **Vania Iordanova Rangelova** Department "Electrical engineering", tel 032 659 685, cab. 3325, email: vaniarangelova@tu-plovdiv.bg, Technical University of Sofia, Branch Plovdiv.

COURSE STATUS IN THE CURRICULUM: Compulsory course for the students of "Automatics, Informatics and Control Engineering", additional or compensatory training for Master's Engineering degree.

PURPOSE OF THE COURSE: Electrical measurements is a fundamental discipline , it aims is to teach the basic techniques and methods of measurement of electrical, magnetic and non-electrical quantities as well as issues related to metrology processing of the measurement results in the presence of systematic and random errors . Acquired knowledge and skills will be required of students in mastering the specific disciplines, in conducting laboratory classes in all disciplines, and when it is necessary to measure and evaluate a physical quantity in any area of practice.

COURSE DESCRIPTION: Students will learn how to measure current, voltage and power in single-phase and three-phase circuits , devices which are necessary to measure the true rms value of sinusoidal and non-sinusoidal currents and voltages , and how to measure parameters of electric circuits ; classify all kinds of errors that affect the result of the measurement , to use a current and voltage measuring transformer, using bridge methods for measuring circuit parameters and frequency , some electronic instrumentation , digital voltmeters , how to measure magnetic field prameters and the characteristics of ferromagnetic materials , how to use various types of oscilloscopes.

PREREQUISITES: Physics, Mathematics, Theoretical Electrical Engineering, Materials Science, Semiconductor Elements.

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

METHOD OF ASSESSMENT: Written exam at the end of the semester- open test 63%, assignments 12%, laboratory exercises 10%, bonuses for self-prepared answers to additional questions 15%.

INSTRUCTIONAL LANGUAGE: Bulgarian.

BIBLIOGRAPHY:

1. Vania Rangelova, Lecture notes on Electrical Measurements, Technical University of Sofia – branch Plovdiv , 2011, ISBN - 978-954-2937-03-6
2. Vania Rangelova, Task roll on Electrical Measurements, Technical University of Sofia – branch Plovdiv , 2011, ISBN - 978-954-2937-04-3
3. Matrakov B, Electrical Measurements, Technical University of Sofia, 1999

ADDITIONAL Books

4. Sergeev A., Krohin V. Metrology , Moskow - Logos, 2001

Description of the course

Name of the course: **Control Instrumentation**	Code: **MpAICE23**	**Semester:1**
Type of teaching: **Lectures and Laboratory work, Course project**	Lessons:L-30 hours; LW-30 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: Compulsory course for the students of "Automatics, Informatics and Control Engineering", additional or compensatory training for Master's Engineering degree.

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.

TEACHING METHODS:

Lectures, laboratory works with reports.

METHODS OF ASSESSMENTS:

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

COURSE DESCRIPTION

Name of the course **Theoretical Electrical Engineering**	Code: **MpAICE24**	Semester **1**
Type of teaching: Lectures, Seminars, Laboratory work and Course work	Lessons: L – 30 hours; S- 15 hours; LW – 15 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 STATUS IN THE CURRICULUM: Compulsory course for the students of "Automatics, Informatics and Control Engineering", additional or compensatory training for Master's Engineering degree.

AIMS AND OBJECTIVES OF THE COURSE: The subject Theoretical Engineering is fundamental that introduces the for students equalization training belonging to AICE Automation, Information and Control Engineering to the basic laws and phenomena of electromagnetism, to the approaches to describe the processes in linear and nonlinear electric and magnetic circuits, and to the methods of analyzing these processes in constant, stationary and non-stationary modes. The basic problems of the electromagnetic field are treated.

DESCRIPTION OF THE COURSE: The subject aims at introducing students to the theory and analysis of three-phase electric circuits, the methods to analyze the transient processes in linear electric circuits and the transient processes in circuits of distributed parameters, introduction to the analysis of non-linear electric circuits and some fundamental issues of the theory of electromagnetic field.

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

TEACHING METHODS: To carry out the laboratory work a guide and patterns of all exercises connected with the research of the behavior of the diagrams studied at the lectures is developed.

METHOD OF ASSESSMENT : Written examination at the end of the forth semester

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:
1.Генов Л., Теоретични основи на електротехниката, София, Техника, 1991. 2. Фархи С., С. Папазов. Теоретична електротехника, ч.1, Техника, С., 1990. 3.Георгиев Н.,Теоретична електротехника, Пловдив, Макрос, 2015. 4. Георгиев Н., В. Кирчев, Ръководство за семинарни упражнения по теоретична електротехника. ТУ София, филиал Пловдив, 2012. 5. Георгиев Н.**,** В. Кирчев, Ръководство за лабораторни упражнения по теоретична електротехника. ТУ София, филиал Пловдив, 2008 г.

DESCRIPTION OF THE COURSE

Name of the course: **Microprocessor systems**	Code: **MPAICE25**	Semester: 1
Type of teaching: Lectures and laboratory work, course work .	Lessons: L – 30 hours; LW – 30 hour	Number of credits: **5**

LECTURERS: Prof. PhD Grisha Spasov (FEA), tel.: 659 724/576, email: gvs@tu-plovdiv.bg, 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 course for the students of "Automatics, Informatics and Control Engineering", additional or compensatory training for Master's Engineering degree.

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 **Semiconductor Electronics**	Code: **MpAICE26**	Semester: **I**
Type of teaching: **Lectures and laboratory work**	Lessons: **L – 30 hours; LW – 30 hour**	Number of credits:**5**

LECTURER:

Assoc. Professor, Ph. D. eng.Anton Lechkov, tel.659766; E-mail: lechkov.a@gmail.com
TechnicalUniversityofSofia - BranchPlovdiv, Department of Electronics

COURSE STATUS IN THE CURRICULUM: Compulsory course for the students of "Automatics, Informatics and Control Engineering", additional or compensatory training for Master's Engineering degree.

AIMS AND OBJECTIVES OF THE COURSE:
At the end of the course the students are expected to have knowledge on basic semiconductors elements, to know their characteristics, mode of operation and influence of temperature on their parameters; to be able to choose appropriate device for given application and to calculate important parameters; to use them in solving of engineering problems.

DESCRIPTION OF THE COURSE:
The main topics concern: Introduction to Semiconductors, Standard and Special Purpose Diodes, Bipolar Junction Transistors, Thyristors, Junction Field Effect Transistors, MOS Transistors, IGBT, Optoelectronic Elements, Introduction to Integrated Circuit.

PREREQUISITES:
Courses of Physics 1, 2 part and Theoretical electrical engineering.

TEACHING METHODS:
Lectures, laboratory exercises with written statements and tests.

METHOD OF ASSESSMENT:
Examination (80 %), laboratory exercises (20%),

INSTRUCTION LANGUAGE– Bulgarian

BIBLIOGRAPHY:1.Христов, М.. Полупроводникови елементи, Нови знания, 2007; 2. Дандаров, А. Оптоелектронипробори и интегрални схеми, ТУ-София, 1991;
3. Вълков, С., Ямаков И., Дойчинова. Електронни и полупроводникови елементи и интегрални схеми, Техника, 2000; 4. Ямаков И., Дойчинова Р, Христов М.Електронни и полупроводникови прибори и интегрални схеми, С, Техника, 1987; 5. ThomasL. Floyd, Electronicdevices, 1988.

DESCRIPTION OF THE COURSE

Name of the course: **Electromechanical devices**	Code: **MpAICE27**	Semester: **2**
Type of teaching: Lecturers (L), Laboratory work (LW) Semester projecs (SP)	Lessons: L- 30 hours; LW- 30 hours	Number of credits: **5**

LECTURER: Assoc.Prof.Ph.D. Georgi Ganev, department of Electrical Engineering, tel.:032659560, email: gganev@tu-plovdiv.bg, Technical University of Sofia, Plovdiv branch

COURCE STATUS OF THE CURRICULUM: Compulsory course for the students of "Automatics, Informatics and Control Engineering", additional or compensatory training for Master's Engineering degree.

AIM AND OBJECT OF THE COURSE: On the completion of the course the students should be able to know the principles of electromechanical power conversion, the construction, principles of operation and characteristics of protection, signal and control electrical apparatuses; to know the construction, principles of operation and characteristics of the transformers, induction, synchronous and DC machines, their applications, mains start-up and speed control methods.

DISCRIPTION OF THE COURSE: The main topics concern: Introduction to the power supply system - generation, transfer, distribution and consumption of electric energy; Construction and operation principles of electrical apparatuses; Electrical apparatuses for control and protection; Single phase transformers - construction and operation principle, main relationships, steady-states behaviors; Induction, synchronous and DC machines constructions, principles of operation, steady-state behaviors and control systems. Micro machines (servomotors, tacho-generators, selsines, etc.) used in the electromechanical systems control.

PREREQUISITES: Mathematics, Physics, Mechanics, Material Science, Electrical Materials, Electrical Engineering Theory, Electrical measurements.

TEACHING METHOD: Lectures with application of demonstrative aids. Laboratory works in teams (3-4 students each). Students should write laboratory report for each laboratory exercise. The semester projects threat the design of different type of electromechanical devices.

METHOD OF ASSESMENT: Written exam at the end of the semester providing 80% of the final score; assessment of the laboratory exercises providing 20% of the final score.

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:

1.Божилов Г., Е.Соколов. Електромеханични устройства. Нови знания, С., 2010. 2.Минчева М. Електромеханични устройства. Нови знания, С., 2005. 3.Динов В.,Ст.Шишкова. Електрически машини.ч.1 и ч.2. Пловдив, 2008, 4.Александров А. Електрически апарати, Техника, С., 1999. 5.Тодоров Г., Б.Стоев. Синхронни двигатели с постоянни магнити., С., 2019. 6. Toliyat, H., G.Kliman. Handbook of electric motors, N.Y.,2004. 7.Ваклев Ил., М.Стоянов, Ръководство за лабораторни упражнения по електромеханични устройства, Техника, С., 1990. 8.Сабинин Ю.А. Электромашинные устройства автоматики, Энергоатомиздат, 1988. 9.Волков Н.И, В.П.Миловзоров, Электромашинные устройства автоматики, Высшая школа, 1986.

DESCRIPTION OF THE COURSE

Name of the course **Control Theory II**	Code: **MpAICE28**	Semester: **2**
Type of teaching: Lectures and laboratory work	Lessons: L – 30 hours; LW – 30 hour	Number of credits: **5**

LECTURER:
Assoc. 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 course for the students of "Automatics, Informatics and Control Engineering", additional or compensatory training for Master's Engineering degree.

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: Laboratory work transactions (20%) 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 **Pulse and digital circuit engineering**	Code: **MpAICE29**	Semester: 2
Type of teaching: Lectures, laboratory work	Lessons: L – 30 hours; LW – 30 hour	Number of credits: 5

LECTURERS:

Prof. Ph.D. G. Petrova (FEA), Dept. of Electronics – tel.: 659 576,
e-mail: gip@tu-plovdiv.bg,
Assoc. Prof. PhD. Ts. Grigorova (FEA), Dept. of Electronics – tel.: 659 721,
e-mail: c_gr@tu-plovdiv.bg,
Technical University of Sofia, branch Plovdiv

COURSE STATUS IN THE CURRICULUM: Compulsory course for the students of "Automatics, Informatics and Control Engineering", additional or compensatory training for Master's Engineering degree.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is to provide students with basic knowledge on theoretical and practical aspects of pulse, digital and power circuits and units together with the methods for their synthesis and analysis.

DESCRIPTION OF THE COURSE: The main topics concern: Logical function and methods for description and minimization; Digital circuits and methods for their synthesis and analysis together with basic principles for building more complex digital units; Basic elements of digital electronics and types of logic families - TTL, CMOS, with their parameters and characteristics; Indicator elements and digital circuits for their control; Design and working principles of relaxation circuits and shapers, mono-vibrators and multi-vibrators, practical circuits with integral timer 555, Schmitt trigger, etc.; Diodes rectifiers, Single-phase and three-phase controlled rectifiers; Voltage-fed transistors inverters – basic characteristics and operation modes;

With laboratory work it is intended to provide the students with practical skills for designing, investigating, testing and evaluating the performance of digital and power circuits and units.

PREREQUISITES: Good fundamental knowledge in the courses: Theoretical Electrotechnic, Semi-conductor electronic devices.

TEACHING METHODS: Lectures and laboratory work with protocols containing experimental results.

METHOD OF ASSESSMENT: Two hours written exam at the end of semester with solving practical problems (80%), laboratory works (20%).

INSTRUCTION LANGUAGE: Bulgarian

BIBLIOGRAPHY:

1. Bobcheva M., St. Tabakov, P. Goranov, Power Electronics, Technica press, 2000; 2. Spasov, Gr., D. Petrova, A. Kostadinov. Digital and microprocessor technology. TU-Sofia, 2012, 3. Mihov G., Digital electronics for BSc students in Electronics, Technical University – Sofia press, 1998; 4. Konov K., Pulse and digital circuits with integral TTL elements, I and II part, Technica press, 1988; 5. Storey Neil. Electronics, A System Approach, UK Addison Weslly, 1992, 6. Petrova, G. Ts. Grigorova. Guide laboratory in pulse and digital circuit engineering, TU-Sofia, Branch Plovdiv, 2007

http://e-shell.tu-plovdiv.bg/index.php?step=22000860&gid=94100110&fid=93000190

COURSE DESCRIPTION

Name of the course: **Systems Identification**	Code: **MpAICE30**	Semester: 2
Type of the education: Lectures, Laboratory exercises	Hours during the semester: Lectures – 30 hours, Lab. exercises – 30 hours.	Credits: 5

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: Compulsory course for the students of "Automatics, Informatics and Control Engineering", additional or compensatory training for Master's Engineering degree.

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: **MpAICE31**	Semester: 2
Type of teaching: Lectures (L) Laboratory work (LW)	Lessons: L – 30 hours; LW – 30 hours	Number of credits: **5**

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 course for the students of "Automatics, Informatics and Control Engineering", additional or compensatory training for Master's Engineering degree.

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: **MpAICE32**	Semester: **2**
Type of teaching: Lectures (L) Laboratory work (LW) Semester assignment (SA)	Lessons: L – 30, LW – 30	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, Magister'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, Technique of Pulse and Digital Circuits, Semiconductor elements, Control Theory, Electrotechnical Theory.

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

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