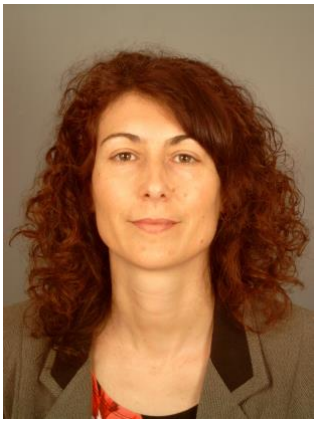
Discipline	Base of automation code: 19, 3 semester – /**winter** /	
Specialty	INDUSTRIAL MANAGEMENT	
ECTS credits: **4**	Form of assessment: Continuous assessment	
Lecturer	Assoc. prof. PhD Eng. / scientific title/ Mariyana Todorova / name/ Room MF 206 Phone: +359896666137 E-mail: mgtodorova@tu-varna.bg	
Department	Automation	
Faculty	Faculty of Informatics and Automatics	

Learning objectives:

The discipline "Base of automation" introduces students to the most important moments of the automation of technological processes. The main functional elements of automatic systems are studied - sensors, automatic regulators, programmable controllers, etc., as well as the fundamental principles for building control systems. On the basis of a large number of examples, the issues of mathematical description of technological processes, synthesis of automatic regulation systems, stability and quality of automatic systems are considered.

The laboratory exercises are thematically focused on the lecture material and aim to consolidate the knowledge gained in lectures and to create certain practical skills.

CONTENTS:		
Training Area	Hours lectures	Hours seminar exercises
1. Introduction to the course in Base of Automation. General information about control systems. Main tasks of automation. Basic concepts and definitions. Examples of control systems.	3	
2. Functional structure of control systems. Basic functional elements of control systems.	2	
3. Closed-loop behaviour of control systems. Control strategies. Examples	2	
4. Static characteristics and dynamic responses of elements and control systems. General form of linear differential equations. The Laplace transform. Transfer function and block diagram	3	
5. Block diagram transformation. Formulas for block connections. Rules for equivalent block diagram transformations	3	
6. Standard dynamic elements and pure time-delay element - mathematical description. Time and frequency responses of standard dynamic elements. Examples	3	
7. Stability. Conditions for stability of linear system. Concept of stability. Necessary condition for stability. Algebraic and frequency domain criteria for checking stability of closed-loop systems	3	
8. Effect of pole locations. The time-domain specifications. Integral criteria	3	
9. An outline of control systems design. Control of dynamic error. P-, PI- and PID- control. Two positions control	3	
10. Programmable logic controllers	2	
11. Control of dynamic error. P-, PI- and PID- control. Two positions control.	3	
Topic 1. Introductory exercise. Getting to know the capabilities of the Matlab programming environment and its Simulink graphical upgrade.		2
Topic 2. Simulating typical input signals in Matlab. Study of time and frequency characteristics.		2
Topic 3. Study of typical dynamic units.		2

Topic 4. Modeling of automatic regulation systems in Matlab and Simulink.		2
Topic 5. Determination of the stability of linear systems according to stability criteria.		2
Topic 6. Determining the quality of the transition processes of the SAC.		2
Topic 7. Study of the influence of the regulator setting parameters on the dynamics of SAC.		2
Topic 8. Protection of protocols and certification of the semester.		1
TOTAL: 45 h	**30**	**15**