

## COURSE OUTLINE

### (1) GENERAL

SCHOOL	SCHOOL OF BUSINESS		
ACADEMIC UNIT	DEPARTMENT OF FINANCIAL & MANAGEMENT ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	MH0107	SEMESTER	5 <sup>th</sup>
COURSE TITLE	AUTOMATIC CONTROL SYSTEMS		
<b>INDEPENDENT TEACHING ACTIVITIES</b> <i>if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits</i>		<b>WEEKLY TEACHING HOURS</b>	<b>CREDITS</b>
LECTURE		3	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		3	5
COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i>	Specialised general knowledge (Required core course)		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	-		
COURSE WEBSITE (URL)	<a href="http://www.fme.aegean.gr/en/c/automatic-control-systems">http://www.fme.aegean.gr/en/c/automatic-control-systems</a>		

### (2) LEARNING OUTCOMES

<b>Learning outcomes</b> <i>The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.</i> Consult Appendix A <ul style="list-style-type: none"> <li>• Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</li> <li>• Descriptors for Levels 6, 7 &amp; 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</li> <li>• Guidelines for writing Learning Outcomes</li> </ul>
<ul style="list-style-type: none"> <li>- Technical knowledge in <ul style="list-style-type: none"> <li>o Understanding dynamic systems</li> <li>o Familiarization with modeling of mechanical, electrical, and electro-mechanical systems, and the related mathematical background</li> <li>o Understanding and familiarization with transient response and systems stability</li> <li>o Familiarization with key techniques of stability analysis</li> <li>o Understanding the types and characteristics of classical controllers</li> <li>o Control system synthesis (design)</li> <li>o Understanding and familiarization with frequency response methods</li> <li>o Students obtain the necessary learning skills that allow them to continue their studies in a self-sufficient and independent manner</li> </ul> </li> <li>- Application of the above in solving problems in analysis and synthesis of control systems.</li> <li>- Students obtain proven knowledge and understanding of basic areas of control systems, which is based on their educational background, and, although it is supported by advanced scientific texts, it includes inputs from the state of the art of their field of knowledge</li> </ul>

- They are in a position to use the knowledge and understanding they obtained from the course in a manner that indicates a professional approach in their work or profession; they obtained abilities that are evident from the synthesis and support of positions and from problem solving in their knowledge area
- They have the ability to collect and interpret relevant information (within their knowledge area), and to develop views that show critical thinking in relevant scientific topics
- They have developed those abilities of acquiring knowledge that are necessary to continue their study under a significant degree of independence

### General Competences

*Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?*

<i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i>	<i>Project planning and management</i>
<i>Adapting to new situations</i>	<i>Respect for difference and multiculturalism</i>
<i>Decision-making</i>	<i>Respect for the natural environment</i>
<i>Working independently</i>	<i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i>
<i>Team work</i>	<i>Criticism and self-criticism</i>
<i>Working in an international environment</i>	<i>Production of free, creative and inductive thinking</i>
<i>Working in an interdisciplinary environment</i>	<i>.....</i>
<i>Production of new research ideas</i>	<i>Others...</i>
	<i>.....</i>

Decision-making  
Working independently  
System design  
Working in an interdisciplinary environment  
Production of free, creative and inductive thinking

### (3) SYLLABUS

#### DESCRIPTION

This course is an introduction to the control of linear dynamic systems. We present basic modeling concepts for mechanical, electrical, and electro-mechanical systems, and the related mathematical background. We analyze system transient response and discuss stability. We focus on key techniques of stability analysis. Furthermore, we discuss classical controllers, and control system synthesis (design). Finally we present frequency response methods.

Week	Contents
1	<ul style="list-style-type: none"> <li>• Introduction to dynamic systems and automatic control</li> </ul>
2	<ul style="list-style-type: none"> <li>• Laplace transform I</li> </ul>

3	<ul style="list-style-type: none"> <li>Laplace transform II</li> <li>Test 1</li> </ul>
4	<ul style="list-style-type: none"> <li>Modeling of electrical and mechanical components and systems</li> </ul>
5	<ul style="list-style-type: none"> <li>Modeling of electromechanical systems</li> </ul>
6	<ul style="list-style-type: none"> <li>Transfer functions</li> <li>Block diagrams</li> <li>Controllers</li> <li>Test 2</li> </ul>
7	<ul style="list-style-type: none"> <li>Steady state response</li> <li>Transient response I</li> </ul>
8	<ul style="list-style-type: none"> <li>Transient response II</li> <li>Routh stability criterion</li> </ul>
9	<ul style="list-style-type: none"> <li>Stability: Root locus</li> <li>Test 3</li> </ul>
10	<ul style="list-style-type: none"> <li>Stability: Root locus</li> <li>Controller synthesis</li> </ul>
11	<ul style="list-style-type: none"> <li>Frequency response</li> <li>Bode diagrams</li> </ul>
12	<ul style="list-style-type: none"> <li>Polar diagrams</li> <li>Test 4</li> </ul>
13	<ul style="list-style-type: none"> <li>Nyquist stability criterion</li> </ul>

#### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>DELIVERY</b> <i>Face-to-face, Distance learning, etc.</i>	Lectures face-to-face	
<b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b> <i>Use of ICT in teaching, laboratory education, communication with students</i>	Use of ICT in teaching, laboratory education, communication with students	
<b>TEACHING METHODS</b> <i>The manner and methods of teaching are described in detail.</i> <i>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.</i>  <i>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</i>	<b>Activity</b>	<b>Semester workload</b>
	Lectures	39
	Weekly Homework	53
	Study	53
	Four Tests	2
	Final Exam	3
	<b>Course total</b>	<b>150</b>
<b>STUDENT PERFORMANCE EVALUATION</b> <i>Description of the evaluation procedure</i>  <i>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical</i>	<b>Assessment Methods:</b> <ul style="list-style-type: none"> <li>Homework 10%</li> <li>Four brief test 40% (10% each)</li> <li>Final exam 50%</li> </ul>	

<p><i>examination of patient, art interpretation, other</i></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p>	
---	--

## (5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

### **A) Principal Reference:**

Dorf R.C, Bishop, R.H, *Modern Control Systems*, Publisher TZOLA-12<sup>th</sup> ed., [2016]

### **B) Additional References:**

Krikelis N., *Introduction to Automatic Control*, Athens Technical University Editions, [2000]