DEPARTMENT OF MECHATRONICS ENGINEERING
COURSE SYLLABUS

Course Details							
Code				**Academic Year**			**Semester**
MEC302				3			6
Titel				**T**	**A**	**L**	**ECTS**
Basics of Control Engineering				3	1	1	6
Langauge	English						
Level	**Undergraduate**	**x**	**Graduate**		**Postgraduate**		
Department/Program	Mechatronics Engineering						
Forms of Teaching and Learning	Formal						
Course Type	**Compulsory**	**x**	**Elective**				
Objectives	The students have an overview of basic methods of control engineering for the analysis and synthesis of control loops. After completing the module, the participants can solve practical problems independently by applying the methods and procedures they have learned through exercises and application examples within a laboratory internship.						
Content	Technical processes and basic concepts of system descriptions in the time domain. System description in the image domain of the Laplace transformation and in the frequency domain. Requirements for the regulation. Stability analysis. Design method with frequency characteristic method. Digital control and special analysis and design processes. Fuzzy control.						
Prerequisities							
Coordinator							
Lecturer(s)	Prof. Dr. Anatoli Makarov						
Assistant(s)	Merve Teke Budaklı , Osman Taha Kütük						
Work Placement							
Recommended or Required Reading							
Books / Lecture Notes	An electronic script is offered. Recommended literature: 1. Makarov, A.: Regelungstechnik und Simulation, Vieweg, 1994 2. Föllinger, O.: Regelungstechnik, Hüthig 1994 3. Lunze, J.: Regelungstechnik 1, Springer, 2004 4. Unberhauen, H.: Regelungstechnkik 1, Vieweg, 2002 5. Horn, M., Dourdoumas, N.: Regelungstechnik, Pearson Studium, 2004 6. Levine, W. S.: The Control Handbook, CRC Press, 1996 7. Dorf, R. C., Bishop, R. H.: Modern Control Systems, Prentice Hall 2004						
Other Sources							
Additional Course Material							

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Documents		
Assignments		
Exams	1 Final Exam	
Zusammensetzung des Moduls		
Mathematics und Basic Sciences		30%
Engineering		30%
Engineering Design		%
Social Sciences		%
Educational Sciences		%
Natural Sciences		%
Health Sciences		%
Expert Knowledge		40%

Assesment

Activity	Count	Percentage (%)
Midterm Exam		
Quiz		
Assignments		
Attendance		
Projects		
Laboratuary		20
Final Exam		80
	Total	**100**

ECTS Points and Work Load

Activity	Count	Duration	Work Load (Hour)
Lectures	14	4	56
Self-Study			
Assignments			
Presentation / Seminar Preparation			
Midterm Exam			
Exercise	14	2	28
Laboratory	5	4	20
Projects			
Final Exam	1	36	36
		Total Work Load	**140**
		ECTS Points (Total Work Load / Hour)	**6**

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Learning Outcomes	
1	Skills for creating and analyzing the system descriptions of the control loops in the time and frequency domains.
2	Knowledge of the forms of description of the elementary transfer elements.
3	Knowledge of the analysis methods of the stability, control and disturbance behavior of the control loops.
4	Knowledge of the analysis and design processes for digital controllers.
5	Students can independently analyze and solve practical control engineering problems.
6	
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Weekly Content	
1	Structure and mode of operation of a regulation
2	Basic requirements for the regulation
3	Setting up, linearizing and normalizing the equations
4	Differential equations of elementary and composite transfer elements
5	Classic method for the analytical calculation of the transition processes
6	Analysis of the transition processes with the help of the Laplace transformation, transfer function
7	Analysis of single-loop control loops, structure and transformation rules
8	Stability, control and disturbance behavior of the control loop, setting rules
9	Mathematical description of linear transfer elements in the frequency domain
10	Open-loop locus and frequency characteristics, Nyquist's stability criterion
11	Controller design with the help of the frequency characteristics
12	Description of digital control loops in the image area of the z-transformation
13	Stability test of the sampling control loops
14	Design process for digital controllers
15	Fuzzy-Control

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Contribution of Learning Outcomes to Program Objectives (1-5)							
	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**
1	2	3	2	3	4	2	2
2	2	2	3	3	4	4	3
3	2	3	4	2	2	2	4
4	3	2	2	2	3	2	3
5	3	3	2	4	4	2	2
6							
7							
8							
9							
10							
11							
12							

Contribution: 1: Low 2: Low-İntermediate 3: Intermediate 4: High 5: Very High

https://obs.tau.edu.tr/oibs/bologna/progLearnOutcomes.aspx?lang=en&curSunit=196

Compiled by:	Prof. Dr. Anatoli Makarov
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