Course unit title:	**MECHATRONICS**		
Course unit code:	ME413		
Type of course unit:	Compulsory		
Level of course unit:	BSc (1 st Cycle)		
Year of study:	4		
Semester when the unit is delivered:	8 (Spring)		
Number of ECTS credits allocated :	6		
Name of lecturer(s):	Dr Christos Themistos		
Learning outcomes of the course unit:	By the end of the course, the students should be able to: 1. Analyze and synthesize modern machines. 2. Create mathematical models of modern machines. Simulate and analyze their behaviour. Design appropriate control systems. 3. Integrate common types of system elements to yield mechatronic systems. 4. Exploit the underlying similarities between the different physical fields (mechanical, electrical, hydraulic, and thermal) to create abstractions for analysis, synthesis and design of mechatronic systems. 5. Solve problems regarding the analysis and control of the function of mechatronic systems using Matlab. 6. Analyze existing mechatronic systems into their structural elements		
Mode of delivery:	Face-to-face		
Prerequisites:	ME327,ME317,ME310, ME304	Co-requisites:	None
Recommended optional program components:	None		
Course contents:	**Integrated Electro-Mechanical Systems** • Mechatronic systems • Functions of mechatronic systems • Ways of information processing **Mechatronic Elements** • Mechanical • Electrical • Hydraulic • Thermal **Fundamentals of theoretical modeling of technical processes** • Classification of process elements • Fundamental equations of process elements with energy and matter flows • Energy balance equations for lumped parameter processes • Connection of process elements • Lagrange's equations • Principle of virtual work • The bond graph method **Electrical drives** • Electromagnets • Direct current motors • Alternating current motors • Power electronics **Sensors** • Signal types, transducers, measuring amplifiers • Velocity, acceleration ,vibration, force, pressure, torque, temperature measurement • Analog to digital conversion **Actuators** • General survey of actuators • Electromechanical actuator drives		

	• Hydraulic actuators • Pneumatic actuators **Control of Mechatronic Systems** • Open loop control • Closed loop control
Recommended and/or required reading:	
Textbooks:	• Rolf Isermann, Mechatronic Systems, Springer, 2005
References:	• W. Boltion, Mechatronics: Electronic control systems in Mechanical and Electrical Engineering • Peter Gawthrop, Lorcan Smith, Metamodelling: Bond Graphs and Dynamic Systems, Prentice Hall, 1st edition, 1995.
Planned learning activities and teaching methods:	Students are taught the course through lectures (3 hours per week) in classrooms or lectures theatres, by means of traditional tools or using computer demonstration. Auditory exercises, where examples regarding matter represented at the lectures, are solved and further, questions related to particular open-ended topic issues are compiled by the students and answered, during the lecture or assigned as homework. Topic notes are compiled by students, during the lecture which serve to cover the main issues under consideration and can also be downloaded from the lecturer's webpage. Students are also advised to use the subject's textbook or reference books for further reading and practice in solving related exercises. Tutorial problems are also submitted as homework and these are solved during lectures or privately during lecturer's office hours. Further literature search is encouraged by assigning students to identify a specific problem related to some issue, gather relevant scientific information about how others have addressed the problem and report this information in written or orally. Students are assessed continuously and their knowledge is checked through tests with their assessment weight, date and time being set at the beginning of the semester via the course outline. Students are prepared for final exam, by revision on the matter taught, problem solving and concept testing and are also trained to be able to deal with time constraints and revision timetable. The final assessment of the students is formative and summative and is assured to comply with the subject's expected learning outcomes and the quality of the course.
Assessment methods and criteria:	• Tests 20% • Homework 15% • Project 20% • Laboratory Work 5% • Final Exam 40%
Language of instruction:	English
Work placement(s):	No