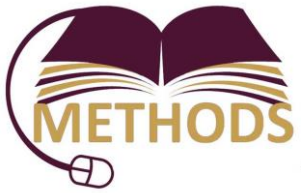

Co-funded by the Erasmus+ Programme of the European Union

Project Title: Modernization of Teaching Methodologies in Higher Education: EU Experience for Jordan and Palestinian Territory

Project acronym: METHODS

Project Number: 561940-EPP-1-2015-1-JO-EPPKA2-CBHE-JP

Funding scheme: Erasmus+ Programme (Capacity-Building projects in the field of Higher Education (E+CBHE))

Start date of the project: 15/10/2015 **Duration:** 36 months

Deliverable title	**Course Outline**
Author(s)	**Lutfi Al-Sharif**
Organisation name(s)	**The University of Jordan**
WP Number	**5**
WP Leader	**Birzeit University**

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The University of Jordan (UJ)

School of Engineering

Course title/code	Mechatronic Systems	0938561
Instructor /office	Lutfi Al-Sharif	
Semester- Year	Fall 2017/2018	
Compulsory/Elective	Compulsory	
Prerequisites	Measurement and Signal Processing – 0908352. Control Systems - 0908451	

Course Description	The course aims to introduce the candidate to the design process of mechatronics systems, actuator types, sizing and selection, measurement systems and transducers selection, control system algorithms and selection of physical controllers, case studies of various mechatronics systems.

Generic Competences*	To develop educational courses by utilising best practice of information communication technology (ICT)
Specific Competences (SCs)	1. To identify whether system dynamics is important in a mechatronics system and justify this decision. (a,c) 2. To list the types of user requirements specifications (URS) in mechatronic systems. (a, c) 3. To explain the principle of operation of the stepper-motor and the servo-motor. (j) 4. To present the project design in an oral presentation and written report. (g) 5. To successfully communicate with members of a team and assign tasks. (d) 6. To solve problems in the design phase of a product. (e) 7. To design a mechatronic system and to evaluate different design and compare them. (c, l) 8. To select and evaluate the appropriateness of suitable types of physical controllers, control algorithms and actuators for mechatronic systems. (a) 9. To explain the principles of operation of incremental and absolute shaft encoders and their areas of application. (j) N.B. The points a to l are the ABET learning outcomes.

	Course Contents	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8	SC9
1	Basic Concepts and Principles	x								
2	User Requirements Specification (URS)		x							
3	Basic Mechanics and Mechanical Drive Systems							x	x	
4	Actuators Overview (including Stepper and Servo-Motors)			x						
5	Actuator Selection Criteria and Selection Examples							x	x	
6	Physical Controller Selection							x	x	
7	Controller Algorithm Selection and Design							x	x	
8	Transducer Selection, Speed and Position Feedback							x	x	X
9	Case Studies	x	x	x				x	x	x
10	Project				x	x	x			

Schedule				
Week	Subject	Activity Description *	Evaluation Criterion	
			Description	%
1	Basic Concepts and Principles	Discussion in class, presentation by students		
2	User Requirements Specification (URS) a	Discussion in class, presentation by students	10 minutes multiple choice quiz	3
3	User Requirements Specification (URS) b	Discussion in class, presentation by students	10 minutes multiple choice quiz	3
4	Basic Mechanics and Mechanical Drive Systems (a)	Solution of problems in class on sizing the torque required for various mechanical drives	10 minutes multiple choice quiz	3
5	Basic Mechanics and Mechanical Drive Systems (b)	Solution of problems in class on sizing the torque required for various mechanical drives	10 minutes multiple choice quiz	3
6	Actuators Overview (including	Presentation by	10 minutes multiple choice	3

	Stepper Motors and Servo-Motors) (a)	students on actuators, discussion	quiz	
7	Actuators Overview (including Stepper Motors and Servo-Motors) (b)	Presentation by students on actuators, discussion	10 minutes multiple choice quiz	3
8	Actuator Selection Criteria and Selection Examples	Solution in class of actuator selection for various systems	10 minutes multiple choice quiz	3
9	Physical Controller Selection	Solution in class of actuator selection for various systems	10 minutes multiple choice quiz	3
10	Controller Algorithm Selection and Design (a)	Class group discussion on control algorithm selection and design for various mechatronic systems	10 minutes multiple choice quiz	3
11	Controller Algorithm Selection and Design	Class group discussion on control algorithm selection and design for various mechatronic systems	10 minutes multiple choice quiz	3
12	Transducer Selection; Speed and Position Feedback	Presentation by students on the latest technologies in this area	10 minutes multiple choice quiz	3
13	Case Study: Drawbridge Design	Group class discussion on the design and alternatives		
14	Project Presentations by students	Presentations in groups to the whole class with discussions and questions from other students	15 minutes for each group: 10 minutes for the presentation and 5 minutes for questions and discussion.	20
15	Project Presentations by students			
16	Final written exam			35

* Project Based Learning will be used as a form of Problem Based Learning.

* The Flipped Classroom approach will be used in teaching the material in this course.

Textbook and References	
Textbook:	• Videos on my You Tube playlist (Mechatronics System Design). • Notes and slides on the JU e-learning website.
References:	• Mechatronics: An integrated approach", Clarence W. de Silva, CRC Press, 2005. • Introduction to Mechatronics and Measurement Systems", Third Edition, David G. Alciatore and Michael B. Histand, McGraw Hill International Edition, 2007.

Overall Assessment Criteria	**Method**	**Weight** [%]
	Mid Term Exam (10 quizzes) The exam will aim to gauge the level of understanding of the student as well as his/her skills in terms of solving problems, setting user requirements and selecting the components of a system design.	30
	Project The project will be assessed by asking the students to prepare a report and make a power-Point presentation about the project.	20%
	Assignments and Presentations These are voluntary presentations that the students are encouraged to make during class time. They are followed by questions and discussions with the students in the class.	5% (bonus)
	Final Exam (written) The student must show that he has the skills to design a system, and to select suitable components of the system such as the physical controller, the control algorithm, the actuator and the transducer.	35%
	Final Exam (controller design using Simulink) Students bring their laptops and are given an assignment to design a control algorithm for a mechatronic system and test is performance.	15%