



Module name: Mechatronics

Academic year: 2013/2014 Code: RMS-2-101-MD-s ECTS credits: 8

Faculty of: Mechanical Engineering and Robotics

Field of study: Mechatronics with English as instruction language Specialty: Mechatronic Design

Study level: Second-cycle studies Form and type of study: Full-time studies

Lecture language: English Profile of education: Academic (A) Semester: 1

Course homepage: —

Responsible teacher: prof. dr hab. inż. Uhl Tadeusz (tuhl@agh.edu.pl)

Academic teachers:

Description of learning outcomes for module

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Connections with FLO	Method of learning outcomes verification (form of completion)
Social competence			
M_K001	Understanding of the need to formulate and communicate information and opinions regarding the achievements of mechatronics.	MS2A_K02	Execution of a project, Execution of laboratory classes
Skills			
M_U001	Student learn to use advanced packages for design and simulation of electronic systems and of software systems.	MS2A_U09	Engineering project, Execution of laboratory classes
M_U002	Ability to formulate a design specification of a complex mechatronic system or device.	MS2A_U09	Engineering project, Execution of a project
Knowledge			
M_W001	Description and practical use of rules and methods of designing with CAD, CAM and CAE Systems in the given scope of application.	MS2A_W04	Examination, Engineering project, Execution of a project

FLO matrix in relation to forms of classes

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Form of classes										
		Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Others	Fieldwork classes	Workshops	E-learning
Social competence												
M_K001	Understanding of the need to formulate and communicate information and opinions regarding the achievements of mechatronics.	-	-	+	+	-	-	-	-	-	-	-
Skills												
M_U001	Student learn to use advanced packages for design and simulation of electronic systems and of software systems.	+	-	+	+	-	-	-	-	-	-	-
M_U002	Ability to formulate a design specification of a complex mechatronic system or device.	+	-	+	+	-	-	-	-	-	-	-
Knowledge												
M_W001	Description and practical use of rules and methods of designing with CAD, CAM and CAE Systems in the given scope of application.	+	-	-	-	-	-	-	-	-	-	-

Module content

Lectures

Mechatronics

1. Solid, Surface and Hybrid Modeling In Part and Assembly Design
2. Integration of CAD/CAM Systems in Mechatronic Design - Introduction
3. Structure and Functionality of the Advanced CAD/CAM System - Example CATIA v.5
4. Product Optimization Aided by Knowledgeware in Design Phase
5. Circuit Board Design with the Help of CAD System
6. Ergonomical Verification of the Designed Object with the Use of CAD Tools
7. Manufacturing Process Design and Simulation
8. Analyses of controlled mechanical systems Performed by LMS Virtual.Lab System)
9. Design of electronic circuits with OrCAD package
10. Simulation of electronic circuits with PSpice package
11. Design of software systems with Rational Rose package
12. Testing of software systems with Rational Robot and Rational Purify packages
13. Introduction to Finite Element Method
14. Algorithm of FEM
15. Model building using FEM. Examples of applications: linear static analyses, linear

dynamic analyses

Laboratory classes

Mechatronics

1. Solid Modeling in Part and Assembly Design
2. Surface Modeling
3. Hybrid Modeling
4. Creation and Utilization of the Knowledge Base
5. Circuit Board Design
6. Design of Milling Operation
7. Preparation of Milling Simulation
8. The Use of Tools for Ergonomical Analyses
9. Introduction to PSpice part 1
10. Introduction to PSpice part 2
11. Creating of sample electronic circuits
12. Simulation of electronic circuits
13. Editing of mixed analogue-digital circuits
14. Simulation of mixed analogue-digital circuits
15. Creation of AD converters circuits
16. Simulation of AD converters circuits

Project classes

Mechatronics

Project 1: Assembly and Part Design of the Given Mechanical System

Project 2: Kinematic Analyses of the Prepared Model of the Mechanical System

Project 3: Drawings of the Assembly and Parts

Project 4: Design of monitoring and control system for chosen mechanical object

Method of calculating the final grade

Average of ...

Prerequisites and additional requirements

Prerequisites and additional requirements not specified

Recommended literature and teaching resources

1. CATIA v.5 - Documentation on line
2. MSC/NASTRAN. Quick Reference Guide.
3. MSC/NASTRAN. Reference Manual.
4. PSpice documentation.
5. Rational Rose (Robot, Purify) documentation.

Scientific publications of module course instructors related to the topic of the module

Additional scientific publications not specified

Additional information

1. Advanced tools of the CAD/CAM system (CATIA v.5) and their use in chosen project applications
2. Introduction to advanced packages for design and simulation of electronic systems and of software systems.
3. Finite Element Method: basic definitions, algorithms. Model building in FEM. Linear analyses: static and dynamic.

Student workload (ECTS credits balance)

Student activity form	Student workload
Examination or Final test	32 h
Participation in laboratory classes	60 h
Participation in project classes	15 h
Realization of independently performed tasks	30 h
Preparation for classes	30 h
Completion of a project	34 h
Summary student workload	201 h
Module ECTS credits	8 ECTS