AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Module name: Mechanics 2

Academic year: 2013/2014 Code: RMS-1-301-s ECTS credits: 6

Faculty of: Mechanical Engineering and Robotics

Field of study: Mechatronics with English as instruction languagege Specialty: —

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

Lecture language: English Profile of education: Academic (A) Semester: 3

Course homepage: —

Responsible teacher: dr hab. inż, prof. AGH Cieślik Jacek (cieslik@agh.edu.pl)

Academic teachers: dr hab. inż, prof. AGH Cieślik Jacek (cieslik@agh.edu.pl)
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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 and knowledge of the possibility of constant individual learning to improve professional, personal and social competence awareness of the responsibility for own work and readiness to comply with the rules of team work ability to correctly set priorities in meeting objectives	MS1A_K01, MS1A_K04, MS1A_K07, MS1A_K06, MS1A_K05	Activity during classes, Examination, Scientific paper, Case study, Participation in a discussion, Execution of exercises, Test results
Skills			

M_U001	ability to acquire information from literature, databases and other sources, integrate, select and interpret the information, draw conclusions, formulate and justify opinions ability to develop documentation related to the completion of an engineering task and prepare text discussing the results of the task ability to prepare and give a brief presentation of the results of the engineering task completed	MS1A_U01, MS1A_U02, MS1A_U04, MS1A_U03	Activity during classes, Examination, Test, Case study, Participation in a discussion, Execution of exercises, Test results
M_U002	ability to evaluate the usefulness of routine methods and tools for solving simple engineering tasks and select and apply proper methods and tools	MS1A_U20	Activity during classes, Examination, Test, Participation in a discussion, Execution of exercises
Knowledge			
M_W001	well-ordered and theory-based knowledge of technical mechanics necessary for formulating and solving problems in mechatronics	MS1A_W01, MS1A_W08, MS1A_W02, MS1A_W07	Activity during classes, Test, Participation in a discussion, Test results, Involvement in teamwork, Examination

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 and knowledge of the possibility of constant individual learning to improve professional, personal and social competence awareness of the responsibility for own work and readiness to comply with the rules of team work ability to correctly set priorities in meeting objectives	+	+	-	-	-	-	-	-	-	-	-
Skills												

M_U001	ability to acquire information from literature, databases and other sources, integrate, select and interpret the information, draw conclusions, formulate and justify opinions ability to develop documentation related to the completion of an engineering task and prepare text discussing the results of the task ability to prepare and give a brief presentation of the results of the engineering task completed	+	+	-	-	-	-	-	-	-	-	-
M_U002	ability to evaluate the usefulness of routine methods and tools for solving simple engineering tasks and select and apply proper methods and tools	-	-	-	-	-	-	-	-	-	-	-
Knowledge												
M_W001	well-ordered and theory-based knowledge of technical mechanics necessary for formulating and solving problems in mechatronics	+	+	-	-	-	-	-	-	-	-	-

Module content

Lectures

Mechanics 2 introduce main principles of dynamics and elements of vibration theory for SDOF and MDOF systems. Syllabus is realized particularly considering use of selected problems of dynamics in robotics and mechatronics.
Dynamics of free and constrained particles. Classification of constraints. Relative motion dynamics. System of particles. Centre of mass motion principle. Mass moments of inertia. Steiner’s theorem. Main and central moments of inertia. Momentum, impulse of a force, angular momentum, conservation laws for momentum and angular momentum. Principles of dynamics for a particle and for a system of particles. Work, power, efficiency, kinetic and potential energy. Equivalence principle of kinetic energy and work. Energy conservation law. Conservative force fields. Dynamic equations of motion for solid body in translation, rotation, plane motion and rotation about a fixed point. Collision of solids. Spherical and general motion of a rigid body. Approximate theory of a gyroscope Lagrange equations of 2nd kind. Undamped and damped linear SDOF vibration. Vibration isolation.

Auditorium classes

Dynamics of free and constrained particles. Classification of constraints. Relative motion dynamics. System of particles. Centre of mass motion principle. Mass moments of inertia. Steiner’s theorem. Main and central moments of inertia. Momentum, impulse of a force, angular momentum, conservation laws for momentum and angular momentum. Principles of dynamics for a particle and for a system of particles. Work, power, efficiency, kinetic and potential energy. Equivalence principle

of kinetic energy and work. Energy conservation law. Conservative force fields. Dynamic equations of motion for solid body in translation, rotation, plane motion and rotation about a fixed point. Collision of solids. Spherical and general motion of a rigid body. Approximate theory of a gyroscope Lagrange equations of 2nd kind. Undamped and damped linear SDOF vibration. Vibration isolation.

Seminar classes

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Method of calculating the final grade
Weighted average of marks from written test, end-of-term test and examination

Prerequisites and additional requirements
Obtained a course credit (passed course) on Mechanics 1

Recommended literature and teaching resources
Beer F.P., Johnston E.R.: Vector Mechanics for Engineers. Statics and Dynamics. McGraw Hill. Boston eds 1997 – 2012.
Hibbeler R. C.: Engineering Mechanics: Statics, 13th Edition, Prentice Hall, 2013
Hibbeler R. C.: Engineering Mechanics: Dynamics, 13th Edition, Prentice Hall, 2013
McGill D., King W.: Mechanics. PWS Engineering, Boston 1985.
Meriam J.L.,Kraige L.G.: Engineering Mechanics, DYNAMICS, 6 edition, Wiley, 2006

Scientific publications of module course instructors related to the topic of the module
Additional scientific publications not specified

Additional information
None

Student workload (ECTS credits balance)

Student activity form	Student workload
Participation in auditorium classes	30 h
Preparation for classes	30 h
Participation in lectures	30 h
Realization of independently performed tasks	58 h
Examination or Final test	2 h
Summary student workload	150 h
Module ECTS credits	6 ECTS