SYLLABUS

Course description

Course code	Course	**MECHANIKA OGÓLNA I**	
MB/O/I/NST/A.4		**ENGINEERING MECHANICS I**	
Language of instruction	English		
Academic year	2023/2024		
field of study:	Mechanical Engineering		
field of specialisation:	All		
Educational level	First-cycle studies		
Education profile	General academic		
Mode of study	Part-time studies		
Semester(s)	1, 2, 3		
Affiliation with a group of classes	Basic classes		
Course status	Obligatory		
Types of classes, instruction hours, ECTS credits	Types of classes	Number of instruction hours	Number of ECTS credits
	Lecture	24 [h]	9 ECTS
	Classes	36 [h]	
Linkage of the course – with the education profile	Related to the conducted scientific activity in the discipline to which the field of study is assigned		9 ECTS
Linkage of the course – with qualifications	It is used to acquire engineering competences by the student		9 ECTS
Linkage of the course – with science discipline	Mechanical engineering		9 ECTS
Form of teaching	Traditional – classes organized at the University /classes conducted using online learning methods and techniques		
Prerequisites	mathematics, physics		
Department	Faculty of Mechanical Engineering		
Coordinator	Krzysztof Kołodziejczyk, Ph. D		
The website of the basic organizational unit	wm.uniwersytetradom.pl		
E-mail address, phone number of the coordinator	k.kolodziejczyk@uthrad.pl, +48 361 71 16		

LEARNING OUTCOMES, CURRICULUM CONTENT, TEACHING CLASSES, VERIFICATION OF LEARNING OUTCOMES

Learning Objective:	C1 - Learning the basic principles and laws of statics in formulating and solving the equilibrium of forces acting on the body remain at rest. C2 - Acquisition of basic skills in the kinematics of particle and kinematics of rigid bodies in plane motion C3 - Understanding the laws and principles of mechanics of motion of bodies under the action of forces in the dynamics for particles and rigid bodies in plane motion.
Curriculum Content:	**Lecture :** STATICS: Basic concepts of mechanics. Vectors. Newton's laws of motion. Principles of statics. Forces. Statics of a rigid bodies: external and internal forces, moment of a force about point. moment of a force about a axis, moment of a couple, reduction of a system of forces, equilibrium of rigid bodies, centroids and centers of gravity, analysis of trusses. Friction: the laws of dry friction, coefficients of friction, angles of friction, wheel friction – rolling resistance, belt friction. KINEMATICS: Kinematics of particles: rectilinear and curvilinear motion of particles: position, velocity and acceleration. Kinematics of rigid bodies: translation, rotation about a fixed axis, general plane motion, absolute and relative velocity and acceleration in plane motion, instantaneous center of rotation in plane motion, plane motion of a particle relative to a rotating frame – Coriolis acceleration, motion about a fixed point. DYNAMICS: Kinetics of particle: Newton's second law. The first and second task of dynamics.. Kinetics of particle: energy and momentum methods. Plane motion of rigid bodies: forces and accelerations. Plane motion of rigid bodies: energy and momentum methods. Mechanical vibrations. **Classes :** STATICS: Vectors. Forces in plane and in space. Resolution of a force into components. Resultant of several convergent and concurrent forces. Reactions at supports and connections. Free body diagram. Solving problems of equilibrium of rigid bodies in two dimensions. Centers of gravity of solids, surfaces and lines. Analysis of static determinate trusses. Solving problems with friction. Solving problems of equilibrium of rigid bodies in three dimensions. KINEMATICS: Motion of a point in rectilinear and curvilinear motion. Position, velocity and acceleration of a point in a Cartesian coordinate system. Position, velocity and acceleration of a point in a the polar coordinate system in the plane. Relative plane motion of a particle. Motion of a rigid body about a fixed point. Plane motion of a rigid body – velocities and accelerations. DYNAMICS: The dynamics of the free and constrained motion of a material point: the first and second task dynamics. Linear vibration own with one degree of freedom. Law variation of momentum and energy and point material system. Law variation of momentum, energy and angular momentum of a rigid body. The equations of motion of a rigid body rotation. The equations of motion of a rigid body plane. Solving plane motion of bodies.
Didactic (educational) methods:	Conventional lecture using audiovisual means. During classes solving problems using classical methods. Examples of using Fusion 360, Nastran In-CAD, Ansys and Matlab/Simulink software to solve selected tasks. The use of models and demonstrators made with 3D printing technology.
Course assessment type, the criteria for assessing the achieved learning outcomes, and the method of calculating the final grade:	The condition for passing the course is to achieve all the required learning out comes specified for the course

	The final grade of the exercises is the average of the grades obtained by the student from the control work. The grade in the lecture is the grade from the tests and the final exam. The final grade for the course is calculated in accordance with the study regulations of UTH Radom

Learning outcomes for the course in relation to the field of study learning outcomes and the type of classes				Methods of verifying learning outcomes	
Learning outcome number	Description of the learning outcomes for the course (PEU) A student who has passed the course (**W**) knows and understands / (**U**) can / (**K**) is ready to:	Field of study learning outcome (KEU)	Types of classes	Form of verification (credits)	Methods of testing and assessment
W1	Student has knowledge in the field of formulating and solving the equilibrium conditions of forces acting on bodies at rest	K_WG01, K_WG02, K_WG05	lecture	credit/exam	written exam (theory + tasks)
W2	Student knows the methods of describing the position and determining the velocities and accelerations of a point using various reference systems, as well as methods of describing the positions and determining the velocities and accelerations of bodies in rotation and plane motion	K_WG01, K_WG02, K_WG05	lecture	credit/exam	written exam (theory + tasks)
W3	Student knows the basic laws and principles of dynamics of a point in curvilinear motion and the laws and principles of dynamics of a body in rotational and plane motion	K_WG01, K_WG02, K_WG05	lecture	credit/exam	written exam (theory + tasks)
U1	Student is able to make reductions and formulate equilibrium conditions of any system of forces, as well as solve technical problems concerning the equilibrium of plane systems of forces	K_UW02, K_UW09	classes	credit	solution of tasks
U2	Student is able to use the methods of describing the kinematics of a point in curvilinear motion with the use of various reference systems, as well as the methods of determining the velocities and accelerations of bodies in rotational and plane motion	K_UW02, K_UW09	classes	credit	solution of tasks
U3	Student is able to formulate dynamic equations of motion of a point and a rigid body in rotational and planar motion, is able to analyze the simplest cases of mechanical vibrations, is able to use the laws of variation of momentum and energy	K_UW02, K_UW09	classes	credit	solution of tasks
U4	Student is aware of the necessity of continuous self-education and supplementing knowledge throughout life	K_UU21	lecture, classes		
K1	Student is aware of the need to expand knowledge of mechanics and is able to choose the appropriate methods of expanding this knowledge for effective solving of technical problems	K_KK01	lecture, classes	Verbal evaluation	Verbal evaluation
K2	Student is aware that in the case of tasks that go beyond their competences, they can use the support of experts.	K_KK02	lecture, classes	Verbal evaluation	Verbal evaluation

Literature and teaching aids
1. Gross D. et al., Engineering Mechanics 1 & 3, Springer 2. McGill D.J., King W.W., Engineering Mechanics: An Introduction to Statics and Dynamics, PWS Publishers 3. Beer F.P. et al., Vector Mechanics for Engineers, McGraw-Hill 4. Hibbeler, R.C. Statics and Mechanics of Materials, SI Edition. Prentice-Hall, 2004

Student workload required to achieve the assumed learning outcomes – the balance of ECTS credits			
Attendance, participation	Student workload [h].		
	Other contact hours (IGK)	Student's self-study hours Classes without a teacher (ZBN)	Classes
Participation in lectures	X	X	24[h]
Participation in classes	X	X	36[h]
Meeting with teachers during their duty hours	15 [h]	X	X
Preparation for lectures/classes, Preparation for credit / exam	X	15 [h] / 55 [h] 55 [h] / 25 [h]	X
Total student workload	15 [h]/ 0,6 ECTS	150 [h]/ 6 ECTS	60 [h]/ 2,4 ECTS
ECTS credits for the course	225 [h]/ 9 ECTS		

Additional information, comments
In the case of students with special needs, including disabilities, and chronic illnesses, the methods and forms of verification of learning outcomes specified above (in the syllabus) are adapted to the individual needs of these students, as appropriate. Detailed rules and forms of support for students with special needs, including those with disabilities and chronically ill, during classes, credits, and exams are specified in: University Regulations (Regulamin Studiów Uniwersytetu Technologiczno-Humanistycznego w Radomiu), Study Regulations (Zasady Studiowania), and Procedure for Ensuring Accessibility of the Educational Process to Students with Special Needs, Including Those with Disabilities and Chronically ill (Procedura dotycząca zapewnienia dostępności procesu kształcenia studentom ze szczególnymi potrzebami, w tym: z niepełnosprawnością, przewlekle chorych).