



Subject card

Subject name and code	Mechanics of Solids and Fluids II, PG_00039796						
Field of study	Materials Engineering, Materials Engineering, Materials Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject				2022/2023	
Education level	first-cycle studies	Subject group				Obligatory subject group in the field of study Subject group related to scientific research in the field of study	
Mode of study	Full-time studies	Mode of delivery				at the university	
Year of study	2	Language of instruction				Polish	
Semester of study	4	ECTS credits				4.0	
Learning profile	general academic profile	Assessment form				exam	
Conducting unit	Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Krzysztof Lipiński				
	Teachers		dr inż. Piotr Patrosz dr hab. inż. Krzysztof Lipiński dr inż. Marzena Banaszek				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	0.0	0.0	45
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	45		5.0		50.0	100
Subject objectives	Acquainting the students with basic principles of kinematics, as well as basic principles of dynamics of particle, dynamics of solid body and mechanics of fluid. Forming of abilities in solving of practical problems, in issues of dynamics of particle, solid body and fluid mechanics.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	K6_K01		understands the need to improve competence in the field of solid and fluid mechanics; is aware of its own limitations and knows when and with what to ask the experts, is able to properly define priorities for the implementation of self or other people			[SK5] Assessment of ability to solve problems that arise in practice	
	K6_W05		Student has read, understood and he can explain phenomena of rigid body dynamics processes and fluid mechanics using language of mathematics and tools of computer supports, He/she can in particular recreate yourself basic theorems and laws			[SW1] Assessment of factual knowledge	
	K6_U06		Is able to integrate elements of information obtained, interpret these fragments and the whole task, as well as draw conclusions and formulate and justify opinions			[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools	

Subject contents	<p>LECTURES Repetition of the main principles of kinematics. Dynamics: The principal terms of dynamics of material point. The special cases of the dynamic equations of motion. The principles of dynamics. Work of a force. Power of a forces. The work-energy principle. Potential. The principle of conservation of mechanical energy. Alternative forms of the work-energy principle. Dynamics of systems of material points. The work of forces that act on systems of material points. The principal terms of dynamics of rigid body. The mass geometry of rigid bodies: mass moments of inertia. Steiner principle. Differential equations of dynamics of translational, rotational and planar motions of rigid body. The momentum, momentum of momentum and kinetic energy of a rigid body in translational, rotational and planar motion. Vibrations of mechanical systems. Introduction, basic concepts and definitions of fluid mechanics, Static of fluids - The hydrostatic pressure. Swimming of bodies; Kinematics of fluids - Principle of mass conservation; Fluid Dynamics - The principle of conservation of momentum. Navier-Stokes equations; The principle of conservation of energy. Bernoullis equation; Criteria of flows similarities; Laminar and turbulent flows. Basic theory of the boundary layers; Flows in closed channels; aerofoil aerodynamics; Cavitations. Physical basis, hydrodynamic effects. EXERCISES: The kinematics of material point and rigid body. Developments and solutions of dynamic equations of motion of material point. d"Alembert principle. The principle of conservation of momentum and the impulse as well as the principle the moment of momentum. Use of principle of work-energy as well as the principle of conservation of energy. Calculation of moments of inertia for rigid bodies. Use of the dynamic equations of motion for translational, rotational and planar motion of rigid body. The use of d"Alemberts principle, reactions of bearings. Vibrations of mechanical systems. Determination of hydrostatic forces on submerged bodies. Application of momentum conservation principle for solving simple fluid flow problems. Application of Bernoulli equation for solving flows in channels.</p>		
Prerequisites and co-requisites	<p>Laws of physics and the mathematics on level of school of average, in this particularly: geometry and trigonometry, differential calculus, vectorial and matrix calculus, the statics and the kinematics of point. Participation in lectures end exercises of Mechanics of solids and fluids I</p>		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquiums	56.0%	50.0%
	Written exam	56.0%	50.0%
Recommended reading	Basic literature		<p>Wittbrodt E., Sawiak S.: <i>Mechanika ogólna. Teoria i zadania.</i> Wyd. PG, Gdańsk, 2012</p> <p>Puzyrewski R., Sawicki A.: <i>Podstawy mechaniki płynów i hydrauliki.</i> PWN, Warszawa, 1998</p>
	Supplementary literature		<p>Leyko J. <i>Mec hanika ogólna, t. 1 i 2,</i> PWN, Warszawa, 2004</p> <p>Gryboś R.: <i>Podstawy mechaniki płynów,</i> tom I, PWN Warszawa 1998</p> <p>Burka E.S., Nałęcz T.J.: <i>Mechanika płynów w przykładach,</i> PWN Warszawa 1999</p> <p>Ciałkowski M.: <i>Mechanika płynów zbiór zadań z rozwiązaniami,</i> Wydawnictwo Politechniki Poznańskiej 2008</p> <p>Tesch K.: <i>Mechanika płynów,</i> Wyd. Politechniki Gdańskiej 2008</p>
	eResources addresses		<p>Adresy na platformie eNauczanie:</p> <p>Mechanika ciała stałego i płynów II W, Inż. Materiałowa, sem4, lato 22/23 (PG_00039796) - Moodle ID: 31117</p> <p>https://enauczanie.pg.edu.pl/moodle/course/view.php?id=31117</p>
Example issues/ example questions/ tasks being completed	<p>Determining of positions of the centres of mass and the mass moments of inertia of rigid bodies. The dynamic analysis of the point mass and stiff bodies, determining of the dynamic reactions at bearings of rotors, with use of the differential equations of rigid body motion as well as the other principles of dynamics. What are the main categories of forces that act on element of fluid. Analysis of parameters of static and dynamic liquids at laminar and turbulent flows in opened and closed channels .</p>		
Work placement	Not applicable		

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