GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Systems Engineering Requirements for Rotating Machines, PG_00060237		
Field of study	Mechanical and Medical Engineering		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2023/2024
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	English
Semester of study	3	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Zakład Mechaniki, Wytrzymałości i Sterowania Złożonych Obiektów Technicznych -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jarosław Szwedowicz	
	Teachers	dr hab. inż. Jarosław Szwedowicz	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	0.0	15

E-learning hours included: 0.0

Additional information:
Lectures based on the presentations provided before classes for taking your own notes.

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	15	0.0	0.0	15

Subject objectives

Wind, gas, micro turbines, aircraft engines, turbochargers, and other mechanical systems are examples of rotating machinery that require highly skilled engineers. They shall understand the complexity of the design and manufacturing processes including Additive Manufacturing, and Predictive Maintenance based on digital engineering to extend the engine failure-free operation.

The course provides the fundamental knowledge required in industry for project management, engineering, and repair. The lectures also enhance engineering skills for future job market in hydrogen-burning machinery.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W08] He/she broad knowledge related to understand social, economic, legal, ecological and other outer techniques conditions of engineering activities in mechanical-medical engineering	Environmental impact on the operation of wind and gas turbines and the basis of combustion of methane, hydrogen, and other fuels in relation to environmental protection.	[SW2] Assessment of knowledge contained in presentation
[K7_W06] He/she in-depth knowledge related to construct, design and build of mechanical devices and mechanical-medical devices	The fundamental expertise for the project management, engineering, and maintenance of complex mechanical systems.	[SW2] Assessment of knowledge contained in presentation
[K7_W07] He/she in-depth knowledge related to engineering materials and technologies used in mechanical-medical engineering	Expertise in the properties of alloys, manufacturing quality, traditional manufacturing technologies with respect to Additive Manufacturing, and assembly of these parts for understanding processes in the industry.	[SW2] Assessment of knowledge contained in presentation
[K7_W09] He/she in-depth knowledge related to diagnosis techniques and medical procedures in the scope of the field of study of mechanical-medical engineering	Predictive Maintenance which applies digital engineering what allows for extending failure free engine operation.	[SW2] Assessment of knowledge contained in presentation

<table>
<tr><td>Subject contents</td><td>This course gives an engineering insight into a rotating equipment, which integrates knowledge of various disciplines. The complexity of the system engineering is related to the common design principles and industrial needs for failure-free operation of rotating machines. Regarding the known material strength and lifing rules, this 15-hour course classifies damage mechanisms with respect to the severe operation conditions of the rotating system under variable rotational speed, evaluated temperatures and high pressures. For these significant loadings, the technologies protecting the component from corrosion, oxidation and overheating are presented in detail. Additionally for a cooled component, the conventional cast process is compared with benefits and limits of todays Additive Manufacturing. The general knowledge obtained from this course allows for the project management and service of rotating machines.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>A 45-min written exam</td><td>25.0%</td><td>100.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>The presentations given in Moodle, that will be explained in detail during lectures for making own notes and remarks.</td></tr>
<tr><td>Supplementary literature</td><td>[1] Christof Lechner, Jörg Seume: Stationäre Gasturbinen, ISBN 3-540-42831-3 Springer-Verlag Berlin Heidelberg New York 2003. This book is very comprehensive (totaling more than 1100 pages).

[2] Claire Soares: Gas Turbines: A Handbook of Air, Land and Sea Applications. Elsevier 2008; ISBN 978-0-7506-769-5.</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>Sample questions for the exam will be given at the end of each lecture, for self-study.

Like e.g., Name three out of the five typical loads acting on wind turbine blades.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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