

Politechnika Warszawska

Unia Europejska Europejski Fundusz Społeczny



Warsaw University of Technology



Faculty of Automotive and Construction Machinery Engineering

WARSAW UNIVERSITY OF TECHNOLOGY

Curriculum

for Mechanical Engineering (conducted in English)

specialisation

Advanced Machinery and Vehicles Engineering

Field of Study

Full-time study

II degree study

Warsaw 2022

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1. BASIC INFORMATION ABOUT THE STUDY

1.1. Faculty: Faculty of Automotive and Construction Machinery Engineering

- **1.2. Field of study:** Mechanical Engineering
- **1.3. Level of study:** Second-cycle study
- 1.4. Profile of study: General academic
- 1.5. Form of study: Full-time study
- 1.6. Language of study: English

1.7. Academic discipline to which the field of study is assigned: Mechanical Engineering

1.8. Number of semesters of study: 4 semesters

1.9. Professional title awarded to graduates: Master of Science

1.10. General educational objectives (description of the profile of graduates of the field of study, graduates of the specialisation):

Graduates of the Mechanical Engineering field of study, conducted in English at the Faculty of Automotive and Construction Machinery Engineering of the Warsaw University of Technology, are characterised by: extensive knowledge of basic subjects and an interdisciplinary and systemic approach to solving technical problems. They are able to work in international English-speaking teams. Graduates have knowledge and skills related to the design, manufacture and operation of machinery and vehicles. They also have skills related to the use of modern design and manufacturing techniques used in the vehicle and machinery industry. They also have knowledge of modern diagnostic methods, as well as are prepared for work related to the operation of machinery and vehicles.

Graduates of the Mechanical Engineering field of study conducted in English are prepared for creative activities in design, research and development or operation-related departments in multinational corporations, as well as in small and medium-sized enterprises dealing with the production and operation of vehicles and machines.

We offer the following specialisation: Advanced Machinery and Vehicles Engineering.

As part of the specialisation, graduates acquire knowledge and skills in the following areas:

- Mechanics of vehicle and machine movement,
- Modelling and computer simulation of phenomena occurring in vehicle and machine movement,
- Structure and design of vehicles: powertrain, chassis and body systems with the use of engineering software,

- Advanced computational methods for numerical simulation of the behaviour of engineering structures,
- Use of modern computer tools and methods used in CAD/CAM/CAE integrated design systems,
- Development of new methods used in computer-aided design and manufacturing,
- Issues related to the structure, design, operation of piston combustion engines and their components,
- Conducting empirical and simulation research on combustion engines,
- Issues concerning the use of alternative fuels used to supply internal combustion engines.

Graduates will find employment in design companies and in research and development centres related to the vehicle and machinery industry in Poland and abroad. Also in production and service firms related to road transport, including public transport companies (buses, trams, and underground). All these companies and institutions are potential workplaces for masters of engineering – graduates of the offered specialisation.

1.11. Prerequisites and expected competence of applicants for the second-cycle study

Applicants for admission to the second-cycle Mechanical Engineering field of study in English must have a first-cycle qualification and the competence necessary to continue their education in the second-cycle Mechanical Engineering field of study. Applicants should have competence including in particular:

- Knowledge and skills in mathematics and physics to understand the physical fundamentals of mechanics and machine construction and to formulate and solve simple machine construction tasks,
- Knowledge and skills in mechanics, thermodynamics, fluid mechanics, and electricity necessary to understand the fundamental physical phenomena that occur in the power transmission systems of machines and vehicles,
- Knowledge of mechanics of materials, including stress and strain states in elements of mechanical structures, necessary to conduct strength analyses,
- Ability to use analytical, simulation and experimental methods to formulate and solve engineering tasks in construction of machines and vehicles,
- 5) Knowledge and skills in the design of power transmission systems and structural components of machinery, including selection of materials, technological process, preparation of technical documentation and preliminary economic evaluation of actions taken,

- 6) Skills to interpret, present and document the results of an experiment and to present and document the results of a design task,
- Abilities to communicate in English in the field of study according to the requirements of at least B2+ according to the Common European Framework of Reference for Languages.

2. DESCRIPTION OF THE EFFECTS OF EDUCATION IN THIS FIELD

Reference	Learning outcomes for	Reference –	Reference
to learning	Mechanical Engineering	symbol I/III	– symbol
outcomes	Literianiea Digiteering	5,111001 1,111	5,11001
in the			
learning			
area of			
study			
program			
10	Knowledge		•
K_W01	has extensive and in-depth knowledge in the	I.P7S_WG.o	P7U_W
	field of chosen areas of mathematics,		
	mechanics, numerical methods, optimization		
	methods including genetic and neural		
	network algorithms indispensable for:		
	1. modelling and analyzing advanced		
	design problems in machine and		
	vehicle construction,		
	2. modelling and synthesizing advanced		
	mechanical systems,		
	3. modelling and analyzing, as well as		
	synthesizing advanced, complex		
	production processes.		
K_W02	has basic knowledge in the field of solid-state	I.P7S_WG.o	P7U_W
	physics, quantum physics, relativistic physics		
	and nuclear physics.		
K_W03	has extensive and in-depth knowledge in the	I.P7S_WG.o	P7U_W
	field of physics (especially mechanics and		
	thermodynamics),		
K_W04	has well-ordered and theoretically-based	I.P7S_WG.o	P7U_W
	knowledge in the field of materials		
	mechanics, indispensable to perform strength		
	analysis of construction elements, including		
	the use of computer systems		
K_W05	has extensive and in-depth knowledge in the	I.P7S_WG.o	P7U_W
	field of advanced modelling and analysis		
	problems applied in fluid mechanics and		

Intended learning outcomes

	thermodynamics		
K_W06	has well-ordered knowledge in the field of modern materials, main development trends and the most important achievements used in machine construction, and ways of determining their mechanical properties, as well as knows economic aspects of their application	I.P7S_WG.o I.P7S_WK	P7U_W
K_W07	has well-ordered and in-depth knowledge in the field of modern integrated production systems	I.P7S_WG.o	P7U_W
K_W08	has well-ordered and in-depth knowledge in the field of solution applied in machine and vehicle automated systems, and development trends which are related to them	I.P7S_WG.o	P7U_W
K_W09	has basic knowledge in the field of contemporary applications of computer tools in solving problems of vehicle and construction machinery design	I.P7S_WG.o	P7U_W
K_W10	has extensive knowledge in the field of integrating new solutions and developments into design and production processes in reference to vehicles and construction machinery	I.P7S_WG.o	P7U_W
K_W11	has in-depth knowledge in the field of computer modeling of machine and vehicle design issues	I.P7S_WG.o	P7U_W
K_W12	has extensive knowledge in the field of machine systems testing and modelling	I.P7S_WG.o	P7U_W
K_W13	knows and understands basic approaches applied in modeling and testing processes of contemporary machines and vehicles	I.P7S_WG.o	P7U_W
K_W14	has well-ordered and in-depth knowledge in the field of diagnosis of technically advanced machines and vehicles	I.P7S_WG.o	P7U_W
K_W15	knows and understands basic methods applied in modeling of technical systems	I.P7S_WG.o	P7U_W
K_W16	has basic knowledge in the field of intellectual property management and patent law, and forms of individual entrepreneurship	I.P7S_WG.o	P7U_W
K_W17	has a basic knowledge of the life cycle and maintenance of construction machinery and vehicles	I.P7S_WG.o III.P7S_WG	P7U_W
K_W18	has elementary knowledge of management, including quality management and conducting business	I.P7S_WK	P7U_W
K_W19	knows the basic rules for the creation and development of forms of individual enterprise	I.P7S_WK III.P7S_WK	P7U_W

Skills								
K_U01	knows how to use learnt mathematical and	I.P7S_UW.o	P7U_U					
	physical methods and models to support	III.P7S_UW.o						
	implementation of engineering processes, by							
	means of assessments and critical analysis							
K_U02	can apply learnt modelling and analyzing	I.P7S_UW.o	P7U_U					
	methods and tools in the processes of solving	III.P7S_UW.o						
	advanced design issues in machine and							
	vehicle construction							
K_U03	knows how to successfully perform	I.P7S_UW.o	P7U_U					
	modelling and synthesizing process of	III.P7S_UW.o						
	advanced mechanical systems, and to							
	critically assess the obtained solutions							
K_U04	knows how to choose proper construction	I.P7S_UW.o	P7U_U					
	materials to design elements of machines and	III.P7S_UW.o						
	vehicles, based on the knowledge of their							
	mechanical properties, and considering the							
	economic assessment of performed							
	engineering actions							
K_U05	can analyze advanced, complex processes	I.P7S_UW.o	P7U_U					
	using contemporary and modern production	III.P7S_UW.o						
	systems, and can use contemporary,							
	integrated production systems,							
K_U06	can apply knowledge using contemporary	I.P7S_UW.o	P7U_U					
	techniques and tools referring to advanced	III.P7S_UW.o						
	solutions in machine and vehicle automated							
	systems,							
K_007	can design optimal elements and systems of	$I.P/S_UW.o$	P/U_U					
	machines and vehicles, considering economic	$III.P/S_UW.0$						
	and functional criteria, using the right							
	methods and tools and considering their							
V LIOO	production technological process	ID7C LIW						
K_008	field of computer advanced modelling in	$\frac{1.7}{5} \frac{1.7}{5} 1.$	P70_0					
	order to analyze and technically simulate	$111.P/S_0 \le 0$						
	issues of machine and vehicle construction							
K 1100	knows how to plan and perform a study of	IP7S IIW o	Ρ7Ι ΤΙΤ					
IX_007	construction machinery and vehicle	III P7S IIW o	170_0					
	mechanical systems and can interpret the	<u> </u>						
	results as well as draw proper conclusions							
K U10	can apply knowledge in the field of	LP7S UW o	P7U U					
11_010	contemporary numerical solutions in	III.P7S UW o	1,0_0					
	construction machinery and vehicle design	0						
K U11	can use knowledge in the field of diagnostics	I.P7S UW.o	P7U U					
	while solving technically advanced	III.P7S UW.o						
	diagnostic problems in machines and							
	vehicles, using analytical simulation and							
	experimental methods							
K_U12	while performing project and research	I.P7S_UW.o	P7U U					
	assignments, is able to recognize the	III.P7S_UW.o						

	components requiring unconventional solutions; while performing project and		
	research assignments, is able to recognize		
	and appreciate innovative and non-technical		
K_U13	can use methods of technical system	I.P7S_UW.o	P7U_U
	modelling in the design of construction	III.P7S_UW.o	
	machinery and vehicles, within the scope of analyzing the obtained solutions		
K_U14	in order to solve engineering problems, can	I.P7S_UW.o	P7U_U
	integrate knowledge coming from different	III.P7S_UW.o	
	sources, both in terms of interdisciplinary		
	in machine and vehicle construction		
K_U15	can obtain information from literature, data	I.P7S_UW.o	P7U_U
_	bases and other sources; can integrate	_	_
	obtained information, interpret it, critically		
	evaluate it, draw conclusions and formulate		
K U16	knows how to develop and present a study on	I.P7S UW.o	P7U U
_	a performed experiment or project	III.P7S_UW.o	_
	assignment; can prepare a comprehensive		
IZ 1117	report on obtained results,		
K_U1/	can prepare and give a presentation on an existing solution and perform a design task in	I.P/S_UK III P7S_UW o	P/U_U
	order to improve an existing solution	III.1 /5_0 W.0	
K_U18	has such command of English or other	I.P7S_UK	P7U_U
	foreign language recognized as medium of		
	international communication in the area of		
	machines and vehicles, which allows proper		
	comprehension of specialized literature, or		
	giving a short presentation on a performed		
	project or research assignment,		
K_U19	can specify fields of further education in	I.P7S_UU	P7U_U
K 1120	can supervise the work of a team in an	LP7S LIW o	P7∐ ∐
K_020	industrial environment, related to project and	1.1 /5_0 W.0	170_0
	research tasks within the field of machine		
	and vehicle design,		
K_U21	can work individually and in group; can	I.P7S_UO	P7U_U
	estimate the time needed to complete a given		
	schedule to ensure deadlines are met.		
	Social Competences		
K_K01	understands the need to formulate and convey	I.P7S_KO	P7U_K
	to a society in a commonly understandable	I.P7S_KR	
	manner information and opinions relating to		
	vehicle construction as well as other aspects		

	of a mechanical engineer's activity		
K_K02	understands the need of a life-long learning,	I.P7S_KK	P7U_K
	can inspire and organize other people's	I.P7S_KO	
	learning process in the field of advanced		
	issues in the field of mechanics and		
	construction machinery		

3. STUDY PLAN

First year/Semester 1

No	Subject	Туре	of cou	irse		ECTS	Symbol
		L	Ε	Lab	Pro	point	credits
1	Complex analysis	30	15	0	0	4	E/Z
2	Probability and statistics	30	15	0	0	4	E/Z
3	Mechanics	30	30	0	0	5	E/Z
4	Integrated production systems	30	0	15	0	3	Z
5	Applied physics	45	0	0	0	4	Z
6	Computer programing	15	0	0	45	8	Z
7	Elective course HES 1	30	0	0	0	2	Z
	Total	210	60	15	45	30	

First year/Semester 2

No	Subject	Туре	Type of course				Symbol
		L	Ε	Lab	Pro	point	credits
1	Computer aided manufacturing	15	0	15	0	3	E/Z
2	Thermodynamics of heat engines	30	15	0	0	3	E/Z
3	Fluid flow computer modelling	15	0	0	15	3	Z
4	Elective course B1	15	0	0	15	3	Z
5	Elective course B2	15	0	0	15	3	Z
6	Elective course B3	15	0	0	15	3	Z
7	Elective course B4	15	0	0	15	3	Z
8	Elective course B5	15	0	0	15	3	Z
9	Interim project I	0	0	0	75	6	Р
	Total	135	15	15	165	30	

Second year/Semester 3

No	Subject	Туре	Type of course				Symbol
		L	E	Lab	Pro	point	credits
1	Design theory	30	0	0	0	2	E/Z
2	Modelling machines and vehicles	30	0	15	15	6	E/Z
3	Machine diagnostics	15	0	15	0	2	Z
4	Elective course A1	30	0	0	0	2	Z
5	Elective course B6	15	0	0	15	3	Z
6	Elective course B7	15	0	0	15	3	Z
7	Elective course B8	15	0	0	15	3	Z

8	Elective course B9	15	0	0	15	3	Z
9	Interim project II	0	0	0	75	6	Р
	Total	165	0	30	150	30	

Second year/Semester 4

No	Subject	Туре	e of co	ourse		ECTS	Symbol
		L	Ε	Lab	Pro	point	credits
1	Diploma seminar	0	30	0	0	2	Z
2	Elective course A2	30	0	0	0	2	Z
3	Elective course B10	15	0	0	15	3	Z
4	Elective course HES 2 *	30	0	0	0	3	Z
5	Master of science thesis	0	0	0	270	20	Р
	Total	75	30	0	285	30	

* the subject must include outcome KW_19

4. STRUCTURE OF THE EDUCATIONAL PROGRAM 4.1. SUBJECTS FROM THE GROUP OF MATHEMATICS AND PHYSICS

Table of subjects in mathematics

No	Subject		Type	of cour	Sum	ECTS		
			L	Ε	Lab	Pro		point
1	Complex analysis		30	15	0	0	45	4
2	Probability statistics	and	30	15	0	0	45	4
	Total		60	30	0	0	90	8

Table of subjects in physics

No	Subject	Type of course			Sum	ECTS	
		L	Ε	Lab	Pro		point
1	Mechanics	30	30	0	0	60	5
2	Applied physics	45	0	0	0	45	4
3	Thermodynamics of heat engines	30	15	0	0	45	3
	Total	105	45	0	0	150	12

4.2. Humanistic, economic and social subjects

No	Subject	Type of course			Sum	ECTS	
		L	Ε	Lab	Pro		point
1	Elective course HES 1	30	0	0	0	30	2
2	Elective course HES 2	30	0	0	0	30	3
	Total	60	0	0	0	60	5

Table of humanistic, economic and social subjects

4.3. SUBJECTS RELATED TO THE SCIENTIFIC DISCIPLINE

No	Subject	Type of course				Sum	ECTS	
		L	Ε	Lab	Pro		point	
1	Mechanics	30	30	0	0	60	5	
2	Integrated production systems	30	0	15	0	45	3	
3	Computer aided manufacturing	15	0	15	0	30	3	
4	Fluid flow computer modelling	15	0	0	15	30	3	
5	Thermodynamics of heat engines	30	15	0	0	45	3	
6	Modelling machines and vehicles	30	0	15	15	60	6	
7	Machine diagnostics	15	0	15	0	30	2	
8	Computer programing	15	0	0	45	60	8	
9	Elective course A1	30	0	0	0	30	2	
10	Elective course A2	30	0	0	0	30	2	
11	Elective course B1	15	0	0	15	30	3	
12	Elective course B2	15	0	0	15	30	3	
13	Elective course B3	15	0	0	15	30	3	
14	Elective course B4	15	0	0	15	30	3	
15	Elective course B5	15	0	0	15	30	3	
16	Elective course B6	15	0	0	15	30	3	
17	Elective course B7	15	0	0	15	30	3	
18	Elective course B8	15	0	0	15	30	3	
19	Elective course B9	15	0	0	15	30	3	
20	Elective course B10	15	0	0	15	30	3	
21	Interim project I	0	0	0	75	75	6	
22	Interim project II	0	0	0	75	75	6	
23	Master of science thesis	0	0	0	270	270	20	
	Total	390	15	60	645	1140	99	

Table of subjects in mechanical engineering

4.4. ELECTIVE SUBJECTS

Table of elective subjects to be chosen by the student

No	Subject	Туре	Type of course			Sum	ECTS
		L	Ε	Lab	Pro		point
1	Elective course A1	30	0	0	0	30	2
2	Elective course A2	30	0	0	0	30	2
3	Elective course B1	30	0	0	0	30	2
4	Elective course B2	30	0	0	0	30	2
5	Elective course B3	15	0	0	15	30	3
6	Elective course B4	15	0	0	15	30	3
7	Elective course B5	15	0	0	15	30	3

No	Subject	Туре	Type of course			Sum	ECTS
8	Elective course B6	15	0	0	15	30	3
9	Elective course B7	15	0	0	15	30	3
10	Elective course B8	15	0	0	15	30	3
11	Elective course B9	15	0	0	15	30	3
12	Elective course B10	15	0	0	15	30	3
13	Interim project I	0	0	0	75	75	6
14	Interim project II	0	0	0	75	75	6
15	Elective course HES 1	30	0	0	0	30	2
16	Elective course HES 2	30	0	0	0	30	3
17	Master of science thesis	0	0	0	270	270	20
	Total	300	0	0	540	840	69

4.5. SPECIALISATION (DIPLOMA PROFILE)

The study specialisation (diploma profile) is determined by the student in consultation with the academic supervisor after the first semester of studies. The thesis supervisor may be a staff member (a research and teaching employee or a teaching employee) with a doctoral degree who is chosen by the student. The role of the supervisor is:

• To determine, together with the student, elective lectures from the list in the field of study related to the specialisation being pursued;

To determine the topic and scope of the diploma thesis.

5. DESCRIPTION OF TEACHING MODULES	(SUBJECTS)
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Description of a subject					
Subject code					
Subject	COMPLEX ANALYSIS				
Subject version	2022/23				
A. Placing the subject wit	hin the study system				
Level of study	II degree				
Form of study	Full-time study				
Field of study	Mechanical Engineering				
Profile of study	General academic				
Degree program	Advanced Machinery and Vehicles Engineering				
Supervising unit	Faculty of Automotive and Construction Machinery Engineering				
Performing unit	Faculty of Automotive and Construction Machinery Engineering				
Subject coordinator					
B. General characterist	ics of the subject				
Subject kind	Basic				
Subject level	Intermediate				
Subject group	Obligatory				
Language of	English				
instruction					
Nominal semester	1				

Course d	elivery in the	Winter						
academic y	year							
Limit of number of 30								
students	number of	30						
C. Learni	ng outcomes a	nd the manner o	of conducting cla	isses				
Aim of the	e subject	Learning methods	of complex analysi	s necessary to stud	y subjects related to t	the field of study.		
Subject ou	tcomes	<u> </u>						
Code	de Description of the outcomes de Description of the outcomes Description of the outcomes							
Knowledg	e				1			
W01	Knowing basic t use them.	heorems in the field	l of Complex Analy	sis the ability to	I.P7S_WG.o	K_W01		
Skills						_		
U01	A student know and knows how	s methods of Compl to apply them.	ex Analysis and La	place Transform	I.P7S_UW.o III.P7S_UW.o	K_U01		
		1	1	1				
Form of their dura	classes and	Lecture	Exercises	Laboratory	Project	Computer classes		
Timetable	S	2	1	0	0	0		
Throughou	ut the semester	30	15	0	0	0		
		exponential complex series, complex function of real variable, differentiation and integration, Complex functions, polynomials. Integration of complex functions. Holomorphic maps and Cauchy-Riemann formula. Complex integral (so called Cauchy's). Cauchy formula. Developing real functions into Mc Laurent series. Residue theorem. Calculating real integrals using residue theorem. Reverse Laplace transform. Applying Laplace transform to solving ordinary differentia equations						
Learning	methods	lecture presentation						
Mathadsa	foramination	exercises problem solving flearning outcomes						
Code	Evaluation met	hods	.3					
Knowleda	e	nous						
W01	Exam, tests, stu	dents' involvement	while solving probl	lems during practic	als.			
Skills								
U01	Exam, tests, stu	dents' involvement	while solving prob	lems during practic	als.			
Evaluation	n methods	Exam, tests, studer	nts' involvement wl	hile solving problen	ns during practicals.			
Exam		Yes						
Reference	es	Materials in English will be shared electronically.						
Subject w	rebsite	-						
D. Studer	D. Student's contribution							
Number	of ECTS	4						
Number	Pullis Number of contact hours 50 including							
student's work		a) lecture – 30h;	act nours- 50, meru	unig.				
connected with		b) practicals - 15 h	;					
achieving learning		c) consultations - 2	2 h;					
outcomes:		d) exam – 3h. 2) Student's indivi	dual work 60 hours	including				
		a 40 h – student's	current prenaration	n for practicals and	lectures, literature si	tudv.		
		b) preparing for te	sts – 10 h	r-ueneuio unu		• • • • • • • • • • • • • • • • • •		
		c) preparing for ex	am – 10 h					
Number	of FCTS points	101AL - 110 h. 2 FCTS points_ pu	mher of contact ho	urs- 50 including				
number (n ners points	- Loro pomo- nu	moer or contact 110	and do, menuumg.				

for classes requiring direct participation of members of academic staff:	a) lecture – 30h; b) practicals - 15 h.; c) consultations - 2 h; d) exam – 3h.			
Number of ECTS points	-			
obtained by a student				
within practical				
E. Additional information				
Comments	-			
Update date	3.10.2022 r.			

Description of a subject							
Subject co	ode						
Subject		PROBABILITY AND STATISTICS					
Subject ve	Subject version 2022/23						
A. Placing	the subject wit	hin the study syste	em				
Level of s	tudy	II degree					
Form of s	tudy	Full-time study					
Field of st	cudy	Mechanical Engine	ering				
Profile of	study	General academi	c				
Degree pi	rogram	Advanced Machine	ery and Vehicles Eng	gineering			
Supervisi	ng unit	Faculty of Automo	tive and Construction	on Machinery Engin	eering		
Performin	ng unit	Faculty of Automo	tive and Construction	on Machinery Engin	eering		
Subject co	oordinator						
B. Genera	al characterist	ics of the subject	t				
Subject ki	nd	Basic					
Subject le	vel	Intermediate					
Subject gi	oup	Obligatory					
Language	of	English					
instructio	n						
Nominal s	semester	1					
Course de academic y	elivery in the vear	Winter					
Pre-requi	sites	-					
Limit of	number of	30					
C Loarni	ng outcomes a	nd the manner o	f conducting cla	6606			
Aim of the	a subject	Learning rules of (Calculus of Probabili	ity and Statistics ind	ispensable to study	subjects related to	
Ann or un	Subject	the field of study.		ty and statistics ma	ispensusie to study	subjects related to	
Subject ou	tcomes						
Code	CodeDescription of the outcomesReference to learning outcomes in the learning areaLearning outcomes j field of stu					Learning outcomes for field of study	
Knowledg	е						
W01	W01Knowing basic methods of Calculus of Probability and Statistics and their application.I.P7S_WG.oK_W01						
Skills							
U01	U01 A student knows basic methods of Calculus of Probability and Statistics and their application. I.P7S_UW.o III.P7S_UW.o K_U01					K_U01	
Form of classes and their duration		Lecture	Exercises	Laboratory	Project	Computer classes	
Timetables	5	2	1	0	0	0	
Throughout the semester		30	15	0	0	0	

Learning content		Mathematical model of random experiment: probabilistic measure. Classical probability. Elements of combinatorics. Geometric probability. Conditional probability, chain formula and formula for total probability. Bayes' theorem. Independence of occurrences. Bernoulli and Poisson scheme. Random one-dimensional variables – discrete and continuous. Probability density function. Bernoulli and Poisson distribution, geometric, uniform, exponential. Cumulative and its properties. Function distribution of random variable. Regular distribution. Parameters of random variable distributions. Value of expectation and variance. Regular and central moments. Limit theorem. Elements of descriptive statistics. Theory of estimation. Confidence intervals. Theory of non-parametric hypotheses.					
Learning	methods	lecture presentation					
		exercises problem solving					
Methods o	f examination o	f learning outcomes					
Code	Evaluation met	thods					
Knowledg	e						
W01	Exam, tests, stu	dents' involvement while solving problems during practicals.					
Skills							
U01	Exam, tests, stu	dents' involvement while solving problems during practicals.					
Evaluation	n methods	Exam, tests, students' involvement while solving problems during practicals.					
Exam		Yes					
Reference	es	Materials in English will be shared electronically.					
Subject w	rebsite	-					
D. Studer	t's contributi	on					
Number	of ECTS	4					
points							
Number o	of hours of	1) Number of contact hours- 50, including:					
student's	work	a) lecture – 30h;					
connected	d with	D) practicals - 15 n.;					
achieving	learning	d) exam $= 3h$					
outcomes	:	2) Student's individual work 60 hours, including:					
		a)40 h – student's current preparation for practicals and lectures, literature study,					
		b) preparing for tests – 10 h					
		c) preparing for exam – 10 h					
		TUTAL – 110 h.					
Number o	of ECTS points	2 ECTS points- number of contact hours- 50, including:					
for class	ses requiring	a) lecture – 30h;					
direct pa	rticipation of	b) practicals - 15 h.;					
members	of academic	c) consultations - 2 n; d) $e_{\text{vom}} = 3h$					
staff:							
Number of ECTS points –		-					
obtained by a student							
within practical							
E. Additio	onal informati	on					
Comment	S	-					
Update date		3.10.2022 r.					

'n

Description of a subject				
Subject code				
Subject	MECHANICS			
Subject version 2022/23				
A. Placing the subject within the study system				
Level of study	II degree			
Form of study	Full-time study			
Field of study	Mechanical Engineering			
Profile of study	General academic			

Degree p	rogram	Advanced Machinery and Vehicles Engineering				
Supervisi	ng unit	Faculty of Automot	tive and Constructio	on Machinery Engin	eering	
Performi	ng unit	Faculty of Automot	tive and Constructio	on Machinery Engin	eering	
Subject co	oordinator					
B. Genera	al characterist	ics of the subiect				
Subject k	ind	Basic				
Subject le	vel	Intermediate				
Subject g	roun	Obligatory				
Language	of	English				
instructio	n or	0 -				
Nominal	semester	1				
Course d	elivery in the	Winter				
academic	year					
Pre-requi	sites	Basic knowledge	in general mecha	nics, theory of vi	brations and stre	ngth of materials
Limit of	number of	30	ee coursesj.			
students	number of					
C Learni	ng outcomes a	nd the manner o	f conducting clas	SSAS		
Aim of th	e subject	Improving knowle	dge in the field of i	mechanics of discre	te and continuous	mediums, variance
Ann or un	c subject	rules, analytical an	d calculation metho	ods of theory of vibr	ations and of streng	th of materials for
		complex issues of r	nachine and constru	uction elements – re	esilient and viscoela	stic.
Subject ou	tcomes	-				
					Reference to	Learnina
Code	Description of	the outcomes			learning	outcomes for
	, in the second se				outcomes in the	field of study
Knowlada	0				learning area	
W01	e Has basic know	lodgo in the field of	application of laws	of machanics to		K W01
WUI	halance and mo	tion of discrete and	continuous mechan	vical systems	LP7S WG o	K W03
	enabling descrip	otion with equations	s of movement and	their simulations.	1.175_00.0	R_W05
W02	Has basic know	ledge in the field of	applied methods for	r solving simple		12 14/01
	problems within	n determining state	and motion of mech	nanical systems in	LP7S WC o	K_W01 K_W03
	the field of mac	hine construction, a	nd knowledge conce	erning various	1.175_W0.0	K_W05
	methods of desc	cribing machine eler	nents.			
W03	Has basic know	ledge concerning at	tenuating propertie	s and ageing of		K_W01
	dynamic phono	ed in machine consti	ction necessary for modelling		I.P/5_WG.0	K_W03
	uynanne pheno	illella.			I.F / 5_VVK	K_W04
Skills						<u></u>
U01	Can perform an	alvsis and interpreta	ation of obtained re	sults connected	LP7S LIW o	K 1101
	with problems of	of machine element	movement in micro	and macro scale.	III.P7S UW.o	K U16
U02	Can apply equat	tions. analytical and	numerical methods	s to solve problems		K U01
	and determine s	strength and dynam	ic parameters of ma	I.P7S_UW.o	K_U02	
				III.P7S_UW.o	K_U15	
						K_U16
U03	Can identify dyr	namic systems in the	e field of discrete an	d continuous		K_U01
	machine elemer	nts both in establish	ed and transition st	ates.	I.P7S_UW.o	K_U02
					III.P75_0W.0	K_U14 K_U16
						<u>K_010</u>
Form of	classes and					
their dur	ation	Lecture	Exercises	Laboratory	Project	Computer classes
Timetables 2 2 0		0	0			
Throughou	it the semester	30	30	0	0	0
				-		
Learning	content	Lecture I and II ty	ype Lagrange equat	tions for holonomic	and non-holonomi	c equations. Gauss
		principle of minim	al constraint, Hamil	ton principle.		•
		Non-linear vibrati	ions, approximate	methods of deter	mining frequency	of vibrations and
		amplitude-frequen	cy characteristics. I	Parametric vibration	ns. Introducing equ	ations of dynamics
		and free vibration	s of typical one-dim	iensional elements	(string, rod, shaft, b	eamJ. Circular flat
		symmetric elastici	ty problem – neavy	wan tubes, rotatii	ig uises, strength 0	i ring and circular

		slabs. Bending, buckling and vibrations of rectangular slabs and panels. Basics of rheology.				
		Elastic and viscoelastic analogy.				
		Practicals Forming equations of motion – Lagrange equations of II type - holonomic and non- holonomic. Determining generalized forces - of right sides of equations of motions using virtual				
		holonomic. Determining generalized forces - of right sides of equations of motions using virtual				
		work method. Determining reaction of constraints using I type Lagrange equations.				
		vibration frequency on amplitude using approximate methods. Determining amplitude				
		frequency characteristics of non-linear systems. Determining frequency and form of vibrations				
		for strings, rollers and beams with different boundary conditions. Determining state of stress				
		and displacement in heavy wall tubes and rotating discs. Calculations of strength for circular				
		and ring slabs. Determining critical strains and frequency of vibrations of rectangular slabs.				
		Using elastic and viscoelastic analogy to determine the course of displacement and stress in				
		basic machine elements.				
Learning	methods	lecture presentation				
		exercises problem solving				
Methods o	f examination o	f learning outcomes				
Code	Evaluation met	thods				
Knowledg	e					
W01	Lecture – exam.	Practicals – tests.				
W02	Lecture – exam.	Practicals – tests.				
W03	Lecture – exam.	Practicals – tests.				
SKIIIS	T	Desetionly to the				
001	Lecture – exam.	Practicals – tests.				
102	Lecture – exam.	Practicals - tests.				
005	Lecture – exam.	Placticals – tests.				
Evaluatio	n methods	Lecture – exam. Practicals – tests.				
Exam		Yes				
Reference	25	Materials in English will be shared electronically.				
Subject w	zehsite	-				
D. Studer	t's contribution	on				
Number	of ECTS	5				
points	01 2010					
Number of	of hours of	1) Number of contact hours- 64, including:				
student's	work	a) lecture -30 h.				
connected	d with	h) practicals $= 30h$.				
achieving	learning	c) consulations – 2 h				
outcomes	; ;;	d) exam - 2 h.				
		2) Student's individual work 76 hours, including:				
		a) 15 h – student's current preparation for lectures.				
		b) 25 h – literature study,				
		c) 21 h – preparation for tests,				
		d) 15 h – preparation for exam				
		3) TOTAL – 140h.				
Number o	of ECTS points	2.5 ECTS points – number of contact hours- 64, including:				
for class	ses requiring	a) lecture – 30 h,				
direct pa	rticipation of	b) practicals – 30h,				
members of academic		c) consulations – 2 h				
staff:		d) exam - 2 h.				
Number o	of ECTS points	-				
obtained	by a student					
within pr	actical					
E. Additio	onal informati	on				
Comment	TS	-				
Update da	te	3.10.2022 r.				

Descriptio	n of a subject					
Subject c	ode					
Subject	INTEGRATED PRODUCTION SYSTEMS					
Subject v	Subject version 2022/23					
A. Placing	; the subject wit	hin the study syste	m			
Level of s	study	II degree				
Form of s	study	Full-time study				
Field of s	tudy	Mechanical Engine	ering			
Profile of	study	General academi	c			
Degree p	rogram	Advanced Machine	ery and Vehicles Eng	gineering		
Supervisi	ing unit	Faculty of Automo	tive and Construction	on Machinery Engin	eering	
Performi	ng unit	Faculty of Automo	tive and Construction	on Machinery Engin	eering	
Subject c	oordinator					
B. Genera	al characterist	ics of the subject	t			
Subject k	ind	Basic				
Subject le	evel	Intermediate				
Subject g	roup	Obligatory				
Language instructio	e of on	English				
Nominal	semester	1				
Course d	elivery in the year	Winter				
Pre-requ	isites	Basic knowledge in	n machine construct	ion technology.		
Limit of	f number of	30				
students						
C. Learni	ng outcomes a	nd the manner o	of conducting clas	sses		
Aim of th	e subject	manufacturing, components of integrated manufacturing and tasks performed in integrated manufacturing, components of integrated manufacturing, their role and application in CIM. Learning about planning material needs, planning manufacturing resources of an enterprise, control structures, manufacturing strategies and their conditionality.				
Subject ou	itcomes					
Code	Description of the outcomes				Reference to learning outcomes in the learning area	Learning outcomes for field of study
Knowledg	ie				1	
W01	Has knowledge planning, plann	in the field of inte ing, scheduling and	grated manufacturi manufacturing cont	ng, material needs rol	I.P7S_WG.o I.P7S_WK	K_W06 K_W07 K_W10 K_W18
W02	Has well-ordered, theoretically based general knowledge in the field of integrated manufacturing (CIM). K_W10 I.P7S_WG.o K_W07 I.P7S_WK K_W10 K_W11 KW11					K_W06 K_W07 K_W10 K_W11
Skills					1	
U01	Can use analytical, simulation and experimental methods to formulate and solve engineering tasks related to manufacturing planning and control. K_U05 K_U06 K_U06 I.P7S_UW.o III.P7S_UW.o III.P7S_UW.o K_U14 K_U15 K_U15					
Form of their dur	classes and ation	Lecture	Exercises	Laboratory	Project	Computer classes
Timetable	S	2	0	1	0	0
Throughout the semester		30	0	15	0	0

Learning content		Lecture: 1. Model of manufacturing. Tasks performed in computer integrated manufacturing. Definition of CIM. Typical CIM chain. 2. Integrated database. Conditions of database organization. Criteria for CIM base choice. 3. Components of computer integrated manufacturing. Marketing research. Planning and control of manufacturing. 4. Planning of MRP material needs. Planning of MRP production resources. 5. Just in time manufacturing. Aims of JIT. 6. Computer aided design using CAD Interfaces. 7. Computer aided process planning CAPP. 8. Quality assurance. Integration of planning and management. 9. KANBAN method, 10. Lean Manufacturing. 11. Group technology. 12. Design for Manufacture and Assembly. 13. Rapid prototyping. 14. Artificial intelligence in CIM. Laboratory: 1. Introduction. Theory of decisions. Normative and descriptive methods. Operational research. 2. Mathematical programming. Function extremes. Classification. Square programming. 3. Linear programming. 4. Dynamic programming. 5. Project management. 6. Network programming.				
Learning	methods	lecture presentation				
		Laboratory 2 projects (design process)				
Methods o	of examination o	f learning outcomes				
Code	Evaluation met	thods				
Knowledg	e					
W01	Written exam.					
W02	Evaluation of in	dividual projects.				
Skills						
U01	Written exam, e	evaluation of individual projects.				
Evaluation	n methods	Written exam, evaluation of individual projects.				
Exam		No				
Reference	es	 Skołud B., Krenczyk D.: Computer Integrated Manufacturing, WNT, 2003, Warszawa. Computer Integrated Manufacturing, Materials from Worldwide Congress on Materials and Manufacturing Engineering and Technology, Gliwice 2005. Instruction for Gantt Project. 				
Subject w	vebsite	-				
D. Studer	nt's contributi	on				
Number	of ECTS	3				
points						
Number o	of hours of	1) Number of contact hours- 76, including:				
student's	work	a) lecture – 30 h,				
connected	d with	b)laboratory – 15 h,				
achieving	learning	c) consulations – 2 h				
outcomes	3:	d) test – 1 h				
		2) Student's individual work 28 hours, including:				
		a) 6 h – student's current preparation for lectures,				
		b) 10 h – work on 2 projects,				
		c) 6 h – literature study,				
		d) 6 h – preparation for test				
		$\frac{3}{101} \frac{101}{101} = \frac{1}{100} \frac{1}{100} = \frac{1}{100} \frac{1}{100} \frac{1}{100} = \frac{1}{100} \frac{1}{1$				
for close	of ECIS points	2 ECIS points – number of contact nours- 76, including:				
direct no	rticipation of	$\frac{d}{dt} = \frac{1}{2} \int dt dt$				
mombors of academic		c) consulations – 2 h				
staff.		d) test $= 1 h$				
Number	of ECTS points	1 ECTS point – 25 h including				
obtained	by a student	a) laboratory – 15 h.				
within pr	actical	b) 10 h – work on 2 projects.				
E. Additio	onal informati	on				
Comment	S	-				
Update date		3.10.2022 r.				

Description of a subject				
Subject code				
Subject	APPLIED PHYSICS			
Subject version	2022/23			
A. Placing the subject wit	hin the study system			
Level of study	II degree			
Form of study	Full-time study			
Field of study	Mechanical Engineering			
Profile of study	General academic			
Degree program	Advanced Machinery and Vehicles Engineering			
Supervising unit	Faculty of Automotive and Construction Machinery Engineering			
Performing unit	aculty of Automotive and Construction Machinery Engineering			
Subject coordinator				
B. General characterist	tics of the subject			
Subject kind	Basic			
Subject level	Intermediate			
Subject group	Obligatory			
Language of instruction	English			
Nominal semester	1			
Course delivery in the academic year	Winter			
Pre-requisites	Basic knowledge of fundamental physics laws, mathematics. Basics of programing.			
Limit of number of students	30			
C. Learning outcomes a	and the manner of conducting classes			
Aim of the subject	Physics with computer techniques. Algorithms for modelling physics laws.			
Subject outcomes	·			

Code	Description of l	the outcomes	Reference to learning outcomes in the learning area	Learning outcomes for field of study		
Knowledg	e					
W01	Has extensive a and analysis pro	nd in-depth knowle oblems	dge in the field of a	dvanced modelling	I.P7S_WG.o	K_W05
W02	Has well-ordere in machine and which are relate	ed and in-depth kno d vehicle automate ed to them	I.P7S_WG.o	K_W02 K_W08		
W03	Has basic knowledge in the field of contemporary applications of computer tools in solving problems.				I.P7S_WG.o	K_W09
W04	Has extensive knowledge in the field of integrating new solutions and developments into design and production processes.				I.P7S_WG.o	K_W10
Skills						
U01	Knows how to u	ise learnt mathemat	tical and physical m	ethods and models	I.P7S_UW.o	K_U01
	to support impl	ementation of engin	eering processes.		III.P7S_UW.o	K_U06
U02	Knows how to make a written and oral presentation within the scope of application. I.P7S_UW.o K_U02					K_U02
U03	Knows how to obtain knowledge on their own, within the scope of issues related to programming and can establish directions for self-study.I.P7S_UW.o III.P7S_UW.o					K_U03
Social Competences						
K01	Can think and act in an entrepreneurial manner.				I.P7S_KO I.P7S_KR	K_K01
К02	Understands the influence of application of smart materials in vehicles and other technical devices and knows how to convey this information to society.				K_K02	
Form of	classes and	Lecture	Exercises	Laboratory	Project	Computer classes

their dura	ation						
Timetable	s	3	0	0	0	0	
Througho	ut the semester	45	0	0	0	0	
		1					
Learning	content	1. Derivativ 2. Mid-poin 3. Runge-Ki	e equation in physic t methods utta methods	s algorithms and m	odeling		
		4. Newton I	aw and vectors in p	hysics algorithms a	nd modeling		
		5. Wave equ	ation, algorithms and	d modeling			
Learning	methods	lecture presentation Project - laborator	on ry class will result	in a score. At the e	end of projects stu	dents will prepare	
Methods	of examination o	f learning outcome	s in groups.				
Code	Evaluation met	thods					
Knowleda	e						
W01	Written test, pro	esentation, discussion	on				
W02	Written test, pro	esentation, discussio	on				
W03	Written test, pro	esentation, discussion	on				
W04	Written test, pro	esentation, discussion	on				
Skills							
U01	Written test. Pr	esentation, discussion	on. Evaluation a pro	ject			
U02	Written test. Pro	esentation, discussion	on. Evaluation a pro	ject			
U03	Written test. Pro	esentation, discussion	on.				
Social Con	npetences						
K01	Presentation, di	scussion. Evaluation	n a project				
K02	Presentation, di	scussion. Evaluation	n a project				
Evaluatio	n methods	Written test. Presentation, discussion. Evaluation a project					
Exam		No					
Reference	es	Material in English					
Subject w	vebsite	-					
D. Studer	nt's contribution	on					
Number	of ECTS	4					
points							
Number o	of hours of	1) Number of contact hours - 45, including:					
student's	work	a) lecture - 15 h.;					
connecte	d with	b) project – 30 h;					
achieving	learning	2) Student S own work:					
outcomes	S:	b) 15 h – preparing for test from lectures/presentations.					
		c) 40 h $-$ preparing project,					
		3) TOTAL – 120 h					
Number of	of ECTS points	4 ECTS point – number of contact hours - 45, including:					
for class	ses requiring	a) lecture - 15 h;					
direct pa	rticipation of	b) project – 30 h;					
members	of academic						
staff:							
Number of	of ECTS points	2 ECTS point - 55 h	n, including:				
obtained	by a student	1) 40 h – preparing	g project,				
within pr	actical	2) 15 h – preparing	g for a test/presenta	tion			
E. Additi	onal informati	on					
Comment	ts	-					
Update da	te	3.10.2022 r.					

SubjectCOMPUTER PROGRAMMINGStubject w=:Sun2022/23A Placing the subject w=:Sun be study systemLevel of studyII degreeForm of studyFuil-time study systemProfile of studyGeneral academicDegree y=:gramAdvanced Machinery and Vehicles EngineeringPerforming unitFaculty of Automotive and ConstructionMachinery BanderMachinery EngineeringPerforming unitFaculty of Automotive and ConstructionRemer=IntermediateSubject IIntermediateSubject IIntermediate	Description	n of a subject						
Subject20/27.3Level of study14 digreeLevel of study64 diataPorm of study64 diataPorm of study64 diataVerifie of study64 diataPorfie of study64 diataSubject is diata76 diataSubje	Subject co	ode						
Subject version 2022/23 A Placing the subject With the study yEN Level of study II degree Porm of study Full-time study Perfel of study General academic Degree program Advanced Machinery and Vehicles Engineering Performing unit Faculty of Automotive and Construction Machinery Engineering Subject coordinator Paculty of Automotive and Construction Machinery Engineering Subject coordinator Paculty of Automotive and Construction Machinery Engineering Subject coordinator Paculty of Automotive and Construction Machinery Engineering Subject level Intermediate Course delivery in the Mark Level Ianguage Computer techniques in mechanical engineering with us of programing language. Limit of number of 30	Subject		COMPUTER PRO	OGRAMMING				
A Placing the subject within the study system Level of study Helf-time study Form of study Ceneral academic Form of study Ceneral academic Super Study Ceneral academic Super Study Ceneral Academic With on Struction Machinery Engineering Subject sour in the study of Automotive and Construction Machinery Engineering Subject sour interacteristics of the subject Subject sour interacteristics of the subject Subject sour interacteristics of the subject Subject sour interacteristics of the subject <th cols<="" td=""><td>Subject ve</td><td>ersion</td><td>2022/23</td><td></td><td></td><td></td><td></td></th>	<td>Subject ve</td> <td>ersion</td> <td>2022/23</td> <td></td> <td></td> <td></td> <td></td>	Subject ve	ersion	2022/23				
Level of study II degree Form of study Full-time study Field of study Mechanical Engineering Profile of study General academic Degree program Advanced Machinery and Vehicles Engineering Supervising unit Faculty of Automotive and Construction Machinery Engineering Subject controlator Faculty of Automotive and Construction Machinery Engineering Subject Venintator Faculty of Automotive and Construction Machinery Engineering Subject Venintator Faculty of Automotive and Construction Machinery Engineering Subject Venintator Faculty of Automotive and Construction Machinery Engineering Subject Venintation Faculty of Automotive and Construction Machinery Engineering Subject Venintation Facility of Machinery and Venintation Machinery Engineering Subject Venintation Facility of Machinery and Venintation Machinery Engineering Venintation Facility of Machinery and Venintation Machinery Engineering Subject Venintation Minter Course delivery in the academic year Facility of Machinery Engineering Language Computer techniques in mechanical engineering with use of programing language. Limit of number of 30 O Course delivery in the a	A. Placing	the subject wit	hin the study syste	em				
Form of study Full-time study Wethering Ingreering Use of study General academic Profile of study General academic State of study General academic State of study State of study General academic Supervising unit Faculty of Automotive and Construction Machinery Engineering State of study	Level of s	tudy	II degree					
Field of study Mechanical Engineering Image: State S	Form of s	tudy	Full-time study					
Profile of study General academic Degree program Advanced Machinery and Vehicles Engineering Supervising unit Faculty of Automotive and Construction Machinery Engineering Subject coordinator Eacure and Learnatedretistics of the subject Subject coordinator Basic Subject coordinator Basic Subject coordinator Basic Subject coordinator Obligatory Obligatory Obligatory Language of English Source delivery in the academic year Basic knowledge of fundamental features of algorithms, knowledge of basics programing language. Limit of number of 30 Subject cource Computer technic is in mechanical engineering with use of programing languages and group work. Subject outcomes Computer technic is in mechanical engineering with use of programing languages and group work. Subject outcomes Computer technic is in mechanical engineering with use of programing languages and group work. Subject outcomes Computer technic is in mechanical engineering metal is analysis problems. Keference to largering outcomes for outcomes for outcomes in the field of advanced modelling in technic and modelling in technic is solving problems. Learning outcomes in the field of solution applications of enginand protuctinto processe. I.P75, WG.0<	Field of st	udy	Mechanical Engine	ering				
Degree program Advanced Machinery and Vehicles Engineering Supert sing unit Faculty of Automotive and Construction Machinery Engineering Performing unit Faculty of Automotive and Construction Machinery Engineering Beeneral theracteristics of the subject Subject ordinator B. General theracteristics of the subject Subject Network Subject roup Obligatory Subject yroup Obligatory Nominal semester 1 Course delivery in the academic year Basic knowledge of fundamental features of algorithms, knowledge of basics programing language. Limit of number of students 30 Subject sture Computer techniques in mechanical engineering with use of programing language. Limit of number of students Computer techniques in mechanical engineering with use of programing language. Subject out	Profile of	study	General academic	c				
Supervising unit Faculty of Automotive and Construction Machinery Engineering Performing unit Faculty of Automotive and Construction Machinery Engineering Subject coordinator B. General - Characteristics of the subject B. General - Characteristics of the subject Subject coordinator Subject level Intermediate Subject group Obligatory Language of English Intermediate Nominal semester 1 Course delivery in the academic year Basic knowledge of fundamental features of algorithms, knowledge of basics programing language. Limit of number of 30 30 Subject server Computer techniques in mechanical engineering with use of programing languages and group work. Subject outcomes Computer techniques in mechanical engineering with use of programing languages and group work. Subject outcomes Interming outcomes in the fact of subtom programing language. Subject outcomes Interming outcomes in the fact of subtom programing language. Subject server Computer techniques in mechanical engineering with use of programing language. Subject server Computer techniques in mechanical engineering with use of programing language. Subject server Computer techniques in mechanical engi	Degree pi	rogram	Advanced Machine	ery and Vehicles Eng	gineering			
Performing unit Faculty of Automotive and Construction Machinery Engineering Subject oranity Basic Subject kind Basic Nominal semester 1 Course delivery in the academicy= Basic knowledge of fundamental features of algorithms, knowledge of sics programing langage. Limit of number of subject Computer techniques in mechanical engineering with use of programing langages and group work. Subject v== Computer techniques in mechanical engineering with use of programing langaring area Reference to learning and analysis problems Learning oranit hearning area Kindeki Eastensive and in-depth knowledge in the field of solution application application and in aceptin kindege in the field of solution application application and i	Supervisi	ng unit	Faculty of Automot	tive and Construction	on Machinery Engin	eering		
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Nominal semester 1 Course delivery in the course of the cours	instructio	n						
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Form of classes and their durationLectureExercisesLaboratoryProjectComputer classesTimetables10030	K01	Can think and a	ct in an entrepreneu	ırial manner.		I.P7S_KO I.P7S_KR	K_K01	
Form of classes and their durationLectureExercisesLaboratoryProjectComputer classesTimetables10030		· · · · · · · · · · · · · · · · · · ·						
Timetables 1 0 0 3 0	Form of	classes and	Lecture	Exercises	Laboratory	Project	Computer classes	
	Timetable	S	1	0	0	3	0	

Throughout	ut the semester	15	0	0	45	0		
Learning	content	1. Basics of versio	n control software,					
		2. Introduction to	Java SDK,					
		3. Overview of the	e environment, the c	onstruction of the e	lementary program)		
		4. Uverview of the	environment GII/0	JIHOR				
		6 Basics of Java n	rograming					
		7. Use of special li	braries to create ow	n programs				
		8. Creating own li	braries.	r o ·				
Learning	methods	lecture presentation	on					
		Project - laborato	ry class will result	in a score At the	e end of each proj	ects (individual or		
		groups) will prepa	re computer progra	ms				
Methods of	of examination o	f learning outcome	es					
Code	Evaluation met	thods						
Knowledg	1e							
W01	Written test. Pr	esentation, discussi	on					
W02	Written test. Pr	esentation, discussi	on					
W03	Written test. Pr	esentation, discussi	on					
W04	Written test. Pr	esentation, discussi	on					
Skills	1							
U01	Written test. Pr	esentation, discussi	on. Evaluation a pro	ject				
U02	Written test. Pr	esentation, discussi	on. Evaluation a pro	ject				
U03	Written test. Pr	esentation, discussi	on. Evaluation a pro	ject				
Social Con	npetences							
K01	Presentation, di	scussion. Evaluation	n a project					
Evaluatio	n methods	Written test. Prese	entation, discussion.	Evaluation a projec	t			
Exam		No						
Reference	es	Materials in English will be shared electronically.						
Subject w	vebsite	-						
D. Studer	nt's contribution	on						
Number	of ECTS	8						
points								
Number of	of hours of	1) Number of cont	act hours - 60, inclu	ding:				
student's	work	a) lecture - 15 h.;						
connecte	d with	b) project – 45 h;						
achieving	learning	2) Student's own work:						
outcomes	5:	a) 30 h – literature studies,						
		1) 50 h - preparing	1) 50 h – preparing individual project,					
		2) 60 h – preparing group project,						
Number	of FCTS points	2 ECTS point – nur	nber of contact hou	rs - 60. including:				
for class	ses requiring	a) lecture - 15 h:						
direct na	articination of	b) project -45 h;						
members	of academic							
staff.	of academic							
Number (of FCTS points	6 ECTS point - 150	h. including:					
obtained by a student		1) 60 h – preparing	g individual project,					
within nr	actical	2) 60 h – preparin	g group project,					
within pi	utitui	3) 30 h – preparin	g for a test/presenta	ation				
E. Additi	onal informati	on						
Comment	ts	-						
Update da	te	3.10.2022 r.						

Descriptio	n of a subject				
Subject c	ode				
Subject	COMPUTER AIDED MANUFACTURING				
Subject v	ersion				
A. Placing	the subject wit	hin the study system			
Level of s	tudy	II degree			
Form of s	tudy	Full-time study			
Field of s	tudy	Mechanical Engineering			
Profile of	study	General academic			
Degree p	rogram	Advanced Machinery and Vehicles Engineering			
Supervisi	ng unit	Faculty of Automotive and Construction Machinery Engine	eering		
Performi	ng unit	Faculty of Automotive and Construction Machinery Engine	eering		
Subject c	oordinator				
B. Genera	al characterist	ics of the subject			
Subject k	ind	Basic			
Subject le	evel	Intermediate			
Subject g	roup	Obligatory			
Language	e of	English			
instructio	n				
Nominal	semester	2			
Course d	elivery in the	Summer			
academic	year				
Pre-requ	isites	Technology of Machine Building; Computer Aided Man CNC machine); 3D CAD systems (learning of 3D modeling)	ufacturing (learning	of programming	
Limit of	number of	30			
students					
C. Learni	ng outcomes a	nd the manner of conducting classes			
Aim of th	e subject	Programming milling and turning in 3D CAM systems f Parameters of generating toolpaths for roughing machini of tool path and virtual simulation of machining (with or v	or CNC machines (find the second surface finished without kinematic of the second seco	rom 2 to 5 axes). ning. Visualization machinery).	
Subject ou	tcomes				
Code	Description of	the outcomes	Reference to learning outcomes in the learning area	Learning outcomes for field of study	
Knowledg	e			1	
W01	Has knowledge	of programming CNC machine tools.	I.P7S_WG.o	K_W01	
W02	Has detailed knowledge of the construction of CNC machine tools, coordinate system of vertical and horizontal 3-, 4- and 5-axis milling centers, standard cutting tools for the CNC vertical milling, reference noints for the milling			K_W11	
W03	Has knowledge parameters and	of roughing and surface milling in 3D CAD systems, their limitations.	I.P7S_WG.o	K_W01	
Skills					
U01	Is prepared to obtain information from literature and other properly chosen sources within the scope of the subject; can integrate the obtained information, interpret it and draw conclusions and formulate and justify opinions within the scope of the application of smart materials in vehicles				
U02	Knows how to programs for Cl	make a written and oral presentation within the scope of NC machine tools.	I.P7S_UW.o	K_U15	
U03	Knows how to milling paramet	obtain knowledge on their own, within the scope of ters with end-tool.	I.P7S_UW.o	K_U15	
Social Cor	npetences				
K01	He understands	the shape's influence on its technology.	I.P7S_KO I.P7S_KR	K_K01	

K02	Can think and act in an entrepreneurial manner.				K_K01		
	I.P/S_KR -						
Form of	classes and	Lecture	Exercises	Laboratory	Project	Computer classes	
Timetable	S	1	0	1	0	0	
Throughou	, it the semester	15	0	15	0	0	
- moughou		10	Ū	10	U U		
Learning content1. Introduction to 3D CAD/CAM systems; type of export/import files (2 models); type of CNC milling and turning machines; coordinate syst horizontal 3-, 4- and 5-axis milling centers; coordinate system of lathes a standard cutting tools for the CNC vertical milling; reference points for the r 			rt/import files (2D coordinate system system of lathes an ice points for the mi files from 2D and election or definitio achining strategy; t ers of visualization nition of safety surf shing); e worked surface; co of CNC machines 'MC).	drawings and 3D n of vertical and d turning centers; lling; 3D CAD systems; n of cutting tools; ype of cycles and n tool paths and faces, borders and			
Learning	methods	lecture presentation	on	controlled avananci	on quatom of a uphia	lo	
Methods o	f examination o	flearning outcome		controlled suspensi	on system of a venic	le	
Code	Evaluation met	thods					
Knowledg	e						
W01	Written test. Pr	esentation, discussion	on				
W02	Written test. Pr	esentation, discussion	on				
W03	Written test. Pr	esentation, discussion	on				
Skills							
U01	Written test. Pr	esentation. discussion	on. Evaluation a pro	iect			
U02	Written test. Pr	esentation. discussion	on. Evaluation a pro	iect			
1103	Written test Pr	esentation discussion	on	,			
Social Con	netences	esentation, aiseason					
K01	Written test Pr	esentation discussion	on Evaluation a pro	iect			
K02	Written test Pr	esentation, discussion	on Evaluation a pro	iect			
102	winden test. i i	escillation, discussion		jeet			
Evaluation	n methods	Written test. Prese	ntation, discussion.	Evaluation a project	t		
Fyam							
References		1.GandariasE.:ManufacturingTechnologiesCNC.Italy2017:https://www.slideshare.net/endika55/cnc-milling-718847582.Siemens NX 12 Help: https://docs.plm.automation.siemens.com/tdoc/nx/12/nx_help3.Edgecam Documentation, Vero, 2018: http://help.edgecam.com4.CATIAV5R20Documentation, Dassault5.RaoM.:Computer6.ComputerAidedDesign7.PaoM.:Computer7.AidedDesignand7.Manufacturing.India,2009:http://nptel.ac.in/courses/112102103/DocumentationDassault					
Subject w	ebsite						
D. Studer	t's contributi	on					
Number	of ECTS	3					
points	<u>()</u>	4) N 1 C		1 12 1 .			
Number o	of hours of	1) Number of cont	act hours – 30 h, inc	luding lecture.			

student's work	2) Student's own work:			
connected with	a) 15 h – literature studies,			
achieving learning	b) 15 h – preparing for test from lectures/presentations.			
outcomes:	TOTAL – 60 h			
Number of ECTS points	1 ECTS point – number of contact hours – 30 h, including lecture;			
for classes requiring				
direct participation of				
members of academic				
staff:				
Number of ECTS points	1 ECTS point - 30 h, including:			
obtained by a student	1) 15 h – preparing a project of a controlled suspension system,			
within practical	2) 15 h – preparing for a test/presentation			
E. Additional information				
Comments	-			
Update date	3.10.2022 r.			

Description	1 of a subject					
Subject co	de					
Subject		THERMODYNAMICS OF HEAT ENGINES				
Subject ve	ersion	2022/23				
A. Placing	the subject wit	hin the study system				
Level of st	udy	II degree				
Form of st	cudy	Full-time study				
Field of st	udy	Mechanical Engineering				
Profile of	study	General academic				
Degree pr	ogram	Advanced Machinery and Vehicles Engineering				
Supervisi	ng unit	Faculty of Automotive and Construction Machinery Engine	eering			
Performin	ıg unit	Faculty of Automotive and Construction Machinery Engine	eering			
Subject co	ordinator					
B. Genera	l characterist	ics of the subject				
Subject ki	nd	Basic				
Subject le	vel	Intermediate				
Subject gr	oup	Obligatory				
Language	of	English				
instructio	n					
Nominal s	emester	2				
Course de	elivery in the	Summer				
academic y	ear	Desis la service de la service de la service de la deservice en la	-handeter (at a hade	1		
Pre-requis	sites	Basic knowledge of thermodynamics, fluid dynamics and o	chemistry (at a bache	elor's levelj		
Limit of	number of	50				
		nd the menner of son dusting classes				
C. Learnin	ig outcomes a	The sim of this source is to provide the students with	Imourladge and und	anatanding of the		
AIII OI UIE	subject	general processes of combustion, heat transfer and fluid describe and discuss phenomena occurring in heat en engines, as well as apply theoretical knowledge into releva	dynamics in the sc ngines, especially pi ant practical cases.	ope necessary to ston combustion		
Subject out	comes					
Code	Description of the outcomes Reference to learning outcomes in the learning area			Learning outcomes for field of study		
Knowledge	2					
W01	Can identify the transfer and gas	ermodynamic processes in the field of combustion, heat s flow.	I.P7S_WG.o	K_W03 K_W05		
W02	Has theoretical definitions. Kno	knowledge concerning kinds of combustions and their we basic terms related to combustion and can calculate	I.P7S_WG.o	K_W03 K_W05		

	fuel composition, the demand for oxidizer and air and the amount and composition of exhaust gases. Can recognize phenomena of heat transfer, select appropriate theoretical descriptions and use them to perform calculations concerning heat and temperature. Has theoretical knowledge on the gas flow and can describe this process by determining the stagnation and critical parameters of the gas as well as balancing					
	energy. Knows	the applicability	of the above-men	tioned theory for		
W03	description of processes occurring in heat engines. Idescription of processes occurring in heat engines. I3 Has the knowledge and understanding of the mechanisms behind the processes of combustion, heat transfer and fluid dynamics in the scope necessary to describe phenomena occurring in piston combustion I.P7S_WG.o K_W03 K_W05 K_W05 K_W05 K_W05					K_W03 K_W05
Skills	engines.					
U01	Can conduct be processes, hear occurring in hear	asic calculations in t transfer and ga at engines.	ndispensable to cor s flow in descrip	nsider combustion tion of processes	I.P7S_UW.o	K_U01 K_U14
Form of their dura	classes and ation	Lecture	Exercises	Laboratory	Project	Computer classes
Timetable	S	2	1	0	0	0
Throughou	ut the semester	30	15	0	0	0
Throughou			10	, v		Ū
Learning Learning Methods of Code Knowledg	content methods <i>f examination o</i> <i>Evaluation met</i>	Lecture: 1) Introduction; 2) Thermodynamics of combustion: quantity balance of the substances in the combustion process, the demand for oxidizer and air in combustion, the amount and composition of exhaust gases, the basics of chemical thermodynamics of combustion, energy balance of the combustion process; 3) Heat transfer: types and basic laws of heat transfer, thermal conduction, thermal convection, thermal radiation, complex heat transfer, heat exchangers; 4) Thermodynamics of flow processes: basic equations of steady flow, the parameters of stagnation, the critical parameters, convergent nozzle, de Laval nozzle, rotary flow machines; 5. Selected aspects of thermodynamic calculations for piston engines. Class exercises: 1) Thermodynamics of combustion: calculating fuel composition, the demand for oxidizer and air, the amount and composition of exhaust gases, balancing the amount of substances and energy in the combustion process; 2) Heat transfer: calculating heat transfer through conduction, convection and radiation, in simple and complex cases; 3) Thermodynamics of flow processes: calculating gas flow, determining the stagnation and critical parameters of the gas, balancing energy of the gas flow. lecture presentation exercises problem solving flearning outcomes				
W01	Lecture – exam,	class exercises – 3	tests			
W02	Lecture – exam,	class exercises – 3	tests			
W03	Lecture – exam,	class exercises – 3	tests			
Skills						
U01	Lecture – exam,	class exercises – 3	tests			
Evaluation	n methods	Lecture – exam, cla	ass exercises – 3 test	ts		
Exam		Yes				
References		1) Michael J. Moran, Howard N. Shapiro: Fundamentals of engineering thermodynamics, John Wiley & Sons, 2010; 2) Glassman I., Yetter R. A.: Combustion, Academic Press, 2014; 3) Serth R. W., Lestina T. G.: Process heat transfer: principles, applications and rules of thumb, Academic Press, 2014; 4) Munson B. R., Okiishi T. H., Huebsch W. W., Rothmayer A. P.: Fundamentals of fluid mechanics John Wiley & Sons, 2013				
Subject w	rebsite	-				
D. Studer	nt's contribution	on				
Number points	of ECTS	3				
Number	of hours of	1) Number of cont	act hours – 55. inclu	ding:		
student's	work	a) lecture – 30 h		0		
connected	d with	b) class exercises -	- 15 h			
achieving	learning	c) consultations – 1 h				

outcomes:	d) exam – 9 h		
	2) Student's individual work – 30 hours, including:		
	a) preparing for lectures and class exercises – 10 h		
	b) preparing for 3 tests – 10 h		
	c) preparing for exam – 10 h		
	3) TOTAL – 85 h		
Number of ECTS points	2,6 ECTS points – number of contact hours – 55, including:		
for classes requiring	a) lecture – 30 h		
direct participation of	b) class exercises – 15 h		
members of academic	c) consultations – 1 h		
staff:	d) exam – 9 h		
Number of ECTS points			
obtained by a student			
within practical			
E. Additional information			
Comments	-		
Update date	3.10.2022 r.		

Description of a subject					
Subject code					
Subject	FLUID FLOW COMPUTER MODELLING				
Subject version	2022/23				
A. Placing the subject wi	thin the study system				
Level of study	II degree				
Form of study	Full-time study				
Field of study	Mechanical Engineering				
Profile of study	General academic				
Degree program	Advanced Machinery and Vehicles Engineering				
Supervising unit	Faculty of Automotive and Construction Machinery Engine	eering			
Performing unit	Faculty of Automotive and Construction Machinery Engine	eering			
Subject coordinator					
B. General characteris	tics of the subject				
Subject kind	Basic				
Subject level	Intermediate				
Subject group	Obligatory				
Language of instruction	English				
Nominal semester	2				
Course delivery in the academic year	Summer				
Pre-requisites	Fluid Mechanics, Thermodynamics, Hydraulic and Pneum	atic Drives, Heat Trai	nsfer		
Limit of number of students	30				
C. Learning outcomes	and the manner of conducting classes				
Aim of the subject Acquiring basic knowledge in the field of numerical modelling of fluid flow (Computation Fluid Dynamics) and the operation of the ANSYS Fluent program, including: creating numerical mesh, setting the solver, assigning boundary conditions, methods for verifying the correctness of the solution, presentation of results.					
Subject outcomes					
Code Description of	ode Description of the outcomes Refere learni outcon learni				
Knowledge					
W01 Acquisition of l Acquisition of obtained by va	knowledge in the field of computer modelling of fluid flow. knowledge in the field of comparative analysis of results rious methods.	I.P7S_WG.o	K_W16		

Skills						
U01	Preparation for performing an independent simulation analysis. Building numerical model, carrying out calculations, verifying the correctness of ULP7S_UW.0 III P7S_UW.0					
U02	obtained results, interpreting results and draw conclusions Image: Conclusion of the second seco				V 1100	
1103	liquid and gas f	liquid and gas flow, and heat transfer.				K_009
003	of technical rep	ort.			III.P7S_UW.o	K_U10
Social Con	npetences					
K01	Understanding of using them knowledge to th	the use of modern in various branche ne public.	computer methods s of industry. The	and the possibility ability to transfer	I.P7S_KO I.P7S_KR	K_K01
			1	1		
Form of	classes and	Lecture	Exercises	Laboratory	Proiect	Computer classes
their dura	ation					
Timetable	S	1	0	0	1	0
Througho	ut the semester	15	0	0	15	0
 modelling in industry. Presentation of the basic numerical equations of fluid mechanics. Presentation of the basic principles of creating a numerical mesh. Overview of possible boundary conditions. Overview of methods to validate the solution and present the results. Simulation analysis of liquid flow in a orifice (a venturi model from a laborato study cavitation). Aerodynamic simulation analysis of the object. Determination of object drag an coefficient Cx. Comparison of simulation results with measurement data. Simulation analysis of liquid pressure losses in the pipeline. Determination of factor for the elbow. Comparison of simulation results with measurement data. Simulation analysis of forced convection. Determination of heat flux and coefficient α [W / m2K]. Simulation analysis of natural convection. Visualization of air movement temperature difference. Determination of heat flux and heat transfer coefficient α [Forceution of two simulation projects and presentation of results in the form 			bratory exercise to ag and object drag on of the local loss a. and heat transfer ement caused by nt α [W / m2K]. form of a report			
Methods of	of examination o	f learning outcome	es			
Code	Evaluation me	thods				
Knowledg	ie					
W01	Execution of tw	o independent simu	lation projects			
Skills	Literation of th	•				
	Procentation di	icquesion project				
001	Presentation di	iscussion, project				
002	Presentation, di	iscussion, project				
003	Presentation, di	scussion, project				
Social Con	npetences					
K01	Presentation, di	iscussion, project				
Evaluatio	n methods	Execution of two independent simulation projects. Presentation, discussion, project				
Exam		No				
Reference	es	1. ANSYS Fluent - I 2. Blazek J. Compu	Jser's Guide tational Fluid Dynai	mics: Principles and	Applications. Elsev	er, 2001
Subject w	vebsite	-	v	· ·		
D. Studer	t's contributi	on				
Number	of ECTS	3				
points	()	1) Number 6	a at h au 201	o of a mus-sti - 1		
Number o	of nours of	1) Number of cont	act nours - 30 nours	s of a practicals.		
student's	WORK	2) Student S OWN V	VOIK - 30 HOURS, INC	iuuilig:		
connecte	d with	b) Work on proper	: 13 HOULS. ring the project: 1 E i	hours		
achieving	glearning	3) TOTAL = 60 box	ing the project 15	110015.		
outcomes	5:	5) 101AL - 00 110t				
Number of	Number of ECTS points1 ECTS points – number of contact hours - 30 hours of a practicals.					

for classes requiring	
direct participation of	
members of academic	
staff:	
Number of ECTS points	1 ECTS points - 30 hours of student's work, including:
obtained by a student	a) work on preparing the project – 15 hours;
within practical	b) literature study: 15 hours
E. Additional informati	on
Comments	-
Update date	3.10.2022 r.

Descriptio	n of a subject					
Subject co	code					
Subject		INTERIM PROJECT I				
Subject v	ersion	2022/23				
A. Placing	the subject wit	hin the study system				
Level of s	tudy	II degree				
Form of s	tudy	Full-time study				
Field of s	tudy	Mechanical Engineering				
Profile of	study	General academic				
Degree p	rogram	Advanced Machinery and Vehicles Engineering				
Supervisi	ng unit	Faculty of Automotive and Construction Machinery Engine	eering			
Performi	ng unit	Faculty of Automotive and Construction Machinery Engine	eering			
Subject co	oordinator					
B. Genera	al characterist	ics of the subject				
Subject k	ind	Specialised				
Subject le	evel	Intermediate				
Subject g	roup	Elective				
Language instructio	e of	English				
Nominal	semester	2				
Course d	elivery in the year	Summer				
Pre-requi	isites	-				
Limit of students	number of	30				
C. Learni	ng outcomes a	nd the manner of conducting classes				
Aim of th	e subject	The aim of the subject is student's completion of the interi	m thesis.			
Subject ou	tcomes	1				
Code	e Description of the outcomes Example 2 Description of the outcomes Description of the outco			Learning outcomes for field of study		
Knowledg	<i>e</i>			1		
W01	Knows how to rules and laws o	obtain data from literature; can evaluate the operation of concerning intellectual property protection.	I.P7S_WG.o III.P7S_WG.o	K_W16 K_W17		
Skills						
U01	1Can design a simple device, system or process, using proper methods, techniques and tools, considering the use of proper materials and technologies necessary in the production process.K_U01III.P7S_UW.oK_U03K_U05K_U08					
U02	Can perform a solutions or pro	an initial economic analysis of designed construction ocesses.	I.P7S_UW.o III.P7S_UW.o	K_U07		
U03	Can obtain da operation of ru	ta from literature and data bases, can evaluate the les and laws of intellectual property protection and can	I.P7S_UW.o III.P7S_UW.o	K_U14 K_U15		

	prepare a clear report or presentation discussing advantages and I.P7S_UK K_U17 disadvantages of different solutions. K_U20							
Social Cor	npetences							
K01	K01 Is aware of the role of a graduate in conveying the achievements in mechatronics of vehicle and construction machinery to the society. I.P7S_KO K_K01				K_K01			
D (· 1 1							
form of	classes and	Lecture	Exercises	Laboratory	Project	Computer classes		
Timetable	s	0	0	0	5	0		
Througho	ut the semester	0	0	0	75	0		
Learning	content	The subject includ in agreement with student's field of s of technical knowle	es student's own w h the Thesis Super tudy. It should refe edge gained by a stu	ork in the scope neo visor. Topic of the r to general-enginee ident up to this mon	cessary to complete e thesis ought to b ering issues and sho nent.	the interim thesis, be connected with buld enable the use		
Learning	methods	Lecture presentati project problem so	on Iving					
Methods of	of examination o	f learning outcome	25					
Code	Evaluation met	thods						
Knowledg	e							
W01	Interim thesis							
SKIIIS	Evaluation of th	a intanim thaaia						
1102	Evaluation of th	e interim thesis						
1102	Evaluation of th	e interim thesis						
Social Cor	Evaluation of th							
K01	Evaluation of th	a interim thesis						
KUI	Lvaluation of th	e internir tilesis						
Evaluatio	n methods	Evaluation of the in	nterim thesis. Interi	m thesis				
Exam		NO						
Reference	es	References chosen by a student in agreement with the Thesis Supervisor within the scope connected with the topic of the thesis.						
Subject w	vebsite	-	-					
D. Studer	nt's contribution	on						
Number	of ECTS	6						
points								
Number	of hours of	1) Number of contact hours - 75 hours of a project.						
student's	work	2) Student s own Work – 35 nours, including: a) literature study: 10 hours						
connecte	d with	b) Work on preparing the project: 25 hours.						
achieving	, learning	3) TOTAL – 110 hc	ours.					
Number	of FCTS points	3 FCTS points - pu	mber of contact ho	urs - 75 hours of a n	roject			
for class	ses requiring		inder of contact not	113 75 110u13 01 u p	l'oject.			
direct na	rticination of							
members of academic								
staff.								
Number	of ECTS points	3 ECTS points - 11	0 hours of student's	work, including:				
obtained	by a student	a) participation in	project practicals - '	75 hours;				
within pr	actical	b) work on prepar	ing the project – 25	hours;				
		c) literature study:	10 hours					
E. Additi	onal informati	on						
Undata da	LS to	- 3 10 2022 r						
opuate da	buate date 5.10.2022 1.							

Description of a subject					
Subject code					
Subject	DESIGN THEORY				
Subject version	2022/23				
A. Placing the subject wit	hin the study system				
Level of study	II degree				
Form of study	Full-time study				
Field of study	Mechanical Engineering				
Profile of study	General academic				
Degree program	Advanced Machinery and Vehicles Engineering				
Supervising unit	Faculty of Automotive and Construction Machinery Engineering				
Performing unit	Faculty of Automotive and Construction Machinery Engineering				
Subject coordinator					
B. General characterist	ics of the subject				
Subject kind	Basic				
Subject level	Intermediate				
Subject group	Obligatory				
Language of instruction	English				
Nominal semester	3				
Course delivery in the academic year	Winter				
Pre-requisites	Basic knowledge on mechanical engineering design.				
Limit of number of	30				
students					
C. Learning outcomes and the manner of conducting classes					
Aim of the subject	Obtaining knowledge on elements of different design methodologies and their methods and tools.				
Subject outcomes					

Code	Description of t	the outcomes	Reference to learning outcomes in the learning area	Learning outcomes for field of study		
Knowledg	Knowledge					
W01	Has knowledge	in the field of the de	esign methodologies	5.	I.P7S_WG.o	K_W01
W02	Has detailed knowledge in the field of the design methodologies.				I.P7S_WG.o	K_W11
W03	Has knowledge within the scope of methods and tools in the field of the design methodologies.				I.P7S_WG.o	K_W01
Skills						
U01	Is prepared to obtain information from literature and other properly chosen sources within the scope of the subject; can integrate the obtained information, interpret it and draw conclusions and formulate and justify opinions within the scope of the application of design methodologies				I.P7S_UW.o	K_U15
U02	Knows how to make a written and oral presentation within the scope of design methodologies				I.P7S_UW.o	K_U15
U03	Knows how to obtain knowledge on their own, within the scope of issue related to application of design methods and can establish directions fo self-study.				I.P7S_UW.o	K_U15
Social Competences						
K01	Understands the influence of application of design methods and knows how to convey this information to society.				I.P7S_KO I.P7S_KR	K_K01
K01	Can think and act in an entrepreneurial manner.				I.P7S_KO I.P7S_KR	K_K01
Form of their dura	classes and ation	Lecture	Exercises	Laboratory	Project	Computer classes

Timetable	s	2	0	0	0	0	
Throughout	ut the semester	30	0	0	0	0	
						1	
Learning	content	 Engineering des Computer Aidea Engineering des Stages of engineering Sequential and design. Product Lifecyce Engineering des Knowledge in m Collaborative pp Mathematical m Typology Survey of Multi-diss Computer Engineering Trends in 	sign and information d Engineering. Scope sign – historical per ing design. concurrent engine le Management - ba sign methodology by nechanical engineer roduct development nodels in mechanica of optimization pro foptimization metho ciplinary optimization r simulation. Optimization ing data bases. n CAD/CAE systems	n processes. e of CAD/CAE. rspective. Elements eering. Design env sic concepts. y Osiński/Wróbel. ing. Repositories of t. l engineering. blems. ods. on. al synthesis of mech development.	of engineering desi ironment. Requirer engineering knowle anisms.	gn methodologies. nents in machine dge.	
Learning	memous	lecture presentation	, , , , , , , , , , , , , , , , , , ,				
Methods of	of examination o	f learning outcome	es				
Code	Evaluation met	thods					
Knowledg	ie						
W01	Written tests						
W02	Written tests						
W03	Written tests						
Skills	1						
U01	Written tests						
U02	Written tests						
U03							
Social Con	nnetences						
K01	Written tests						
V02	Discussion						
K02	Discussion						
Fyaluatio	n methods	Lecture - 2 tests (w	vritton)				
Evam	n methous	Yes					
		Materials in English (for each lecture based on different knowledge sources)					
Reference	es	וימנכוזמוס זון בווצווסון נוטר כמכוו וככנערכ, טמסכע טון עווופרפווג גווטשופעצפ סטערנכסן					
Subject w	rebsite						
D. Studer	it's contribution	on					
Number	of ECTS	2					
points Number of hours of student's work connected with		 Number of contact hours - 30, including: a) lecture - 30 h.; Student's own work: a) 15 h - literature studies, 					
outcomes:		 b) 15 h – preparing for tests from lectures/presentations, 3) TOTAL – 60 h 					
Number of ECTS points for classes requiring direct participation of members of academic		1 ECTS point – number of contact hours - 30, including: a) lecture - 30 h;					
Number of obtained within pr	of ECTS points by a student actical	 1 ECTS point - 30 h, including: 1) 15 h – preparing a project of a controlled suspension system, 2) 15 h – preparing for tests 					
E. Additi	onal informati	on					
Comment	ts	-					
Update da	te	3.10.2022 r.					

Description of a subject						
Subject code						
Subject	MODELLING MACHINES AND VEHICLES					
Subject version	2022/23					
A. Placing the subject w	ithin the study system					
Level of study	II degree					
Form of study	Full-time study					
Field of study	Mechanical Engineering					
Profile of study	General academic					
Degree program	Advanced Machinery and Vehicles Engineering					
Supervising unit	Faculty of Automotive and Construction Machinery Engine	eering				
Performing unit	Faculty of Automotive and Construction Machinery Engine	eering				
Subject coordinator						
B. General character	stics of the subject					
Subject kind	Basic					
Subject level	Advanced					
Subject group	Obligatory					
Language of instruction	f English					
Nominal semester	3					
Course delivery in thacademic year	e Winter					
Pre-requisites	Knowledge and skills concerning:					
	- basic algebra incl. matrices and linear equations,					
	- differential and integral calculus,					
	- differential equations,					
	- principles of mechanics – linear and angular momentum laws, kinetic energy law					
	- Lagrangian mechanics,					
	- basic knowledge on strength of materials,					
	- Fourier and Taylor series,					
	- fundamentals of signal processing,					
	- basic concepts of object and procedural programming.					
Limit of number of	f 30					
students						
C. Learning outcomes	and the manner of conducting classes		line the demonstra			
Aim of the subject	The main goal of that lecture is to present a comprehensi modelling of mochanical systems. During the classes st	ve knowledge regard	aing the dynamics			
	concepts which are necessary to perform efficient analysis of physical systems behaviour. A					
	very important and skills developing part of the lecture is an involvement of Python					
	programming in order to enable conducting the analysis of a dynamics of the considered system					
	motion. The three main topics will be considered:					
	- governing equations obtaining with an application of Lagrangian mechanics,					
	- numerical solving of differential equations with SciPy,					
	- time-domain and spectral analysis by utilization of NumPy and matplotlib libraries.					
	approach allows for a comparison of the analytical methods and tools used for an approximate modelling of the physical phenomena with the more accurate pumerical					
	simulations results.	inter die mere de				
Subject outcomes						
		Reference to	Learning			
Code Description	f the outcomes	learning	Learning outcomes for			
bescription	outcomes in the	field of study				
Knowladza		iearning area	. , . ,			
W01 Knows kinds	of models, methods and techniques of modelling within the		17 1474 4			
scope of phys	ical and mathematical models	I.P7S_WG.o	K_W11 K_W12			
W02 Knows moth	ds of parameter and structural identification of dynamic		K W11			
models	as or parameter and structural identification of dynamic	LP7S WC o	K W12			

Skills									
U01	Can plan and pe	erform a research ar	nd development exp	eriment.	I.P7S_UW.o III.P7S_UW.o	K_U01 K_U09			
U02	Can analyze and	Can analyze and evaluate modelling precision.			I.P7S_UW.o III.P7S_UW.o	K_U01 K_U02 K_U08 K_U14			
Social Competences									
K01	Can think and a	Can think and act in an entrepreneurial manner.		I.P7S_KO I.P7S_KR	K_K01				
Form of classes and their duration		Lecture	Exercises	Laboratory	Project	Computer classes			
Timetable	S	2	0	1	1	0			
Througho	ut the semester	30	0	15	15	0			
Learning content		 Lagrangian and Newtonian mechanics - review, basics of programming in Python with SageMath, single and Multi DOF systems with linear elasticity, continuous systems and nonlinear problems, numerical simulations of mechanical systems, Fourier series and transformation, spectra of elementary functions, sampling, windowing, filtering in time and frequency domain, spectral analysis, sampling frequency, Nyquist frequency identification problem formulation, parametric identification. 							
		laboratory experimental or numerical study preparing a project							
Methods of	of examination of	f learning outcome	es						
Code	Evaluation met	thods							
Knowleag		1	·						
W01	Exam, test befor	re admitting to exer	cises, evaluation of	reports.					
WUZ	Exam, test befor	re admitting to exer	cises, evaluation of	reports.					
JUO1	Writton tosta								
1102	Writton tosts								
Social Con	nnetences								
K01	Test before adm	nitting to exercises	evaluation of task ex	xecution and report	evaluation				
K02	Exam test befor	re admitting to exercises,	cises evaluation of	renorts	evaluation.				
1102	Linaili, test seroi	e dumitting to ener	cibes, evaluation of						
Evaluation methods		Projects: preparing project and homework which needs to utilize practical ability to solve simple problems as examples of theory presented within the lecture. Attestation of class exercises. Lecture: written examination on skills and knowledge concerning the scope of the course.							
Exam		Yes							
References		Materials in English will be shared electronically.							
Subject website -									
D. Studer	nt's contributi	on							
Number of ECTS points		6							
Number of hours of		1) Student work with tutor - 65 hours, including:							
student's work		a) lecture - 30 hours;							
connected with		b) project - 15 hours;							
achieving learning		c) laboratories - 15 nours; d) consultations - 2 hours:							
outcomes:		e) exam - 3 hours.							
		2) Independent student work - 85 hours, including:							
		a) student preparing for lectures - 15 hours;;							

Number of ECTS points for classes requiring direct participation of members of academic staff:	 b) literature investigation - 15 hours; c) student preparing of project - 25 hours; d) student preparing for laboratories - 15 hours; e) student preparing for exam- 15 hours. 3) TOTAL - 150 hours 2.6 ECTS point. Student work with tutor - 65 hours, including: a) lecture - 30 hours; b) project- 15 hours; c) laboratories - 15 hours; c) consultations - 2 hours; d) exam - 3 hours. 					
Number of ECTS points obtained by a student within practical	No separate credits for lecture and class.					
E. Additional information						
Comments	-					
Update date	3.10.2022 r.					

Descriptio	n of a subject							
Subject c	ode							
Subject		COMBUSTION AND CATALYSIS						
Subject v	ersion	2022/23						
A. Placing	A. Placing the subject within the study system							
Level of study		II degree						
Form of study		Full-time study						
Field of study		Mechanical Engineering						
Profile of study		General academic						
Degree program		Advanced Machinery and Vehicles Engineering						
Supervising unit		Faculty of Automotive and Construction Machinery Engineering						
Performing unit		Faculty of Automotive and Construction Machinery Engineering						
Subject coordinator								
B. Genera	al characterist	ics of the subject						
Subject kind		Basic						
Subject level		Advanced						
Subject group		Elective A						
Language of		English						
instruction								
Nominal semester		3						
Course delivery in the		Winter						
academic year								
Pre-requisites		Basic knowledge of thermodynamics and heat engines theory (at a bachelor's level)						
Limit of	number of	30						
students								
C. Learning outcomes and the manner of conducting classes								
Aim of the subject		studying the basic chemical processes that are taking place during fuel's combustion in automotive spark ignition and diesel engines. The theory and operation of emission control systems.						
Subject ou	tcomes	· ·						
Code	de Description of the outcomes		Reference to learning outcomes in the learning area	Learning outcomes for field of study				
Knowledge								
W01	Student who has passed the subject knows the combustion process in combustion engines and the methods of exhaust gases aftertreatment.		K_W03 K_W05					
W02	Has knowledge of controlling the combustion process in internal combustion engines, including the impact on the engine performance and its emission by adjustment fuel delivery system parametersI.P7S_WG.oK_W03 K_W12							
---	---	---	--	---	---------------------------------------	---------------------		
Skills								
U01	Able to conduct an analysis of the engine's operating cycles taking into account combustion phenomena and pollutants formation.I.P7S_UW.oK_U01III.P7S_UW.oK_U14					K_U01 K_U14		
U02 Is able to analyze basic chemical processes occurring during fuel combustion in spark-ignition and self-ignition engines, as well as issues related to the theory and operation of exhaust gas aftertreatment systems.				I.P7S_UW.o III.P7S_UW.o	K_U14			
				1				
Form of their dura	classes and ation	Lecture	Exercises	Laboratory	Project	Computer classes		
Timetable	S	1	0	0	1	0		
Througho	ut the semester	15	0	0	15	0		
0		1		1				
Learning content Lectures Lectures Lectures consist of two thematic packages: Lectures consist of two thematic packages: Combustion Combustion chemistry Stochiometric combustion Combustion temperature Combustion thermochemistry Harmful substances formation Fuels Combustion in SI engines Combustion in Diesel engines Visualization of combustion and films on combustion phenomena Catalysis Fundamentals of catalytic reactor design Deactivation of catalytic reactors Coxidizing reactors Redox reactors CR reactors Eurodementals of particulate filters design				henomena				
Learning	methods	lecture presentation	n					
Methods	f evamination of	f learning outcome	00					
Codo	Fugluation mod	hoda	<i>.</i>					
coue	Evaluation met	liious						
Knowleag	<i>ie</i>							
W01	Written test. Pr	esentation, discussio	on					
W02	Written test. Pr	esentation, discussion	on					
Skills								
U01	Written test. Pr	esentation, discussion	on. Evaluation a pro	ject				
U02	Written test. Pr	esentation, discussion	on. Evaluation a pro	ject				
Evaluatio	n methods	Lectures: two writ marks from all wri	ten tests on skills ar tten tests are neede	nd knowledge conce d to complete (pass	rning the scope of t) the course.	he course. Positive		
Exam		No						
References		 Heywood J.: Internal combustion engine fundamentals, McGrew Hill 1998. Stone R.: Introduction to Internal Combustion Engines, Macmillan Press London 1992. Merker G., Schwarz C., Teichmann R. : Combustion Engines Development: Mixture Formation, Combustion, Emissions and Simulation, Springer Wiesbaden 2009. Arcoumanis C., Kamimoto T.: Flow and Combustion in Reciprocating Engines, Springer Berlin 2009. 						
D Chude	t's contribut							
D. Studer	it s contributio							
Number	ot ECTS	2						
points								
Number o	of hours of	1) Number of conta	act hours – 31 hours	s, including:				
student's	work	a) lectures – 30 ho	urs.;					
connecte	d with	b) consultations –	1 hour					

Update date	3.10.2022 r.		
Comments	-		
E. Additional information			
within practical			
obtained by a student			
Number of ECTS points	-		
staff:			
members of academic			
direct participation of	b) consultations – 1 hour		
for classes requiring	a) lectures – 30 hours;		
Number of ECTS points	1.2 ECTS points – number of contact hours – 31 hours, including:		
	3) TOTAL – 46 hours		
outcomes.	b) student's preparation for tests – 5 hours		
outcomes	a) literature study – 10hours;		
achieving learning	2) Student's own work – 15 hours, including:		

Description	of a subject			
Subject co	de			
Subject		MACHINE DIAGNOSTICS		
Subject ver	rsion	2022/23		
A. Placing t	the subject wit	hin the study system		
Level of stu	udy	II degree		
Form of st	udy	Full-time study		
Field of stu	ıdy	Mechanical Engineering		
Profile of s	study	General academic		
Degree pro	ogram	Advanced Machinery and Vehicles Engineering		
Supervisin	ıg unit	Faculty of Automotive and Construction Machinery Engine	eering	
Performing	g unit	Faculty of Automotive and Construction Machinery Engine	eering	
Subject coo	ordinator			
B. General	l characterist	ics of the subject		
Subject kir	nd	Basic		
Subject lev	vel	Intermediate		
Subject gro	oup	Obligatory		
Language instruction	of	English		
Nominal se	emester	3		
Course del academic ye	livery in the ear	Winter		
Pre-requis	ites	Measurements of dynamic variables and method of ana material mechanics and basics of vibroacoustic analysis.	lyzing signals. Know	ing vibrations of
Limit of	number of	30		
students				
C. Learnin	g outcomes a	nd the manner of conducting classes		
Aim of the subject The aim of the subject is to learn advanced methods of modelling and simulation of diagonal information generation, analysis of cause-effect relationship between diagnostic parameters, and technical condition parameters, determining classes and classifiers of alert threshol preparing students to use and analyze diagnostic systems. The object of the subject is to information acquitted during lecture during practice in laboratory.			tion of diagnostic ostic parameters rt thresholds and ubject is to apply	
Subject outo	comes	· · · · ·	· · ·	
Code	Description of t	the outcomes	Reference to learning outcomes in the learning area	Learning outcomes for field of study
Knowledge	•			
W01	Has well-order connected with	ed, theoretically based knowledge detailed knowledge chosen aspects of machine diagnostics.	I.P7S_WG.o	K_W14

W02	Knows development trends and the most important achieveme connected with machine diagnostics.				I.P7S_WG.o	K_W14	
W03	Has basic knowledge related to lifecycle of machines.				I.P7S_WG.o	K_W14	
Skills							
U01	Can determine of self-study.	directions od furthe	er self-study and pe	erform the process	I.P7S_UW.o	K_U19	
U02	Can solve engineering problems and problems connected with machine diagnostics using proper methods and means. I.P7S_UW.o III.P7S_UW.o I.P7S_UK				K_U11 K_U12 K_U14 K_U15 K_U16 K_U17		
Form of their dura	classes and	Lecture	Exercises	Laboratory	Project	Computer classes	
Timetable	5	1	0	1	0	0	
Throughou	it the semester	15	0	15	0	0	
Inoughou	at the semester	15	0	13	U	U	
Learning content Lecture: General knowledge concerning diagnosing of typical faults of rotating machinery Diagnosing machinery faults, Diagnosing imbalance and eccentricity, Diagnosing misalig bent shaft and cocker bearing, Diagnosing looseness, Diagnosing rotor rub and journal b faults, Diagnosing resonant conditions, Diagnosing rolling element bearing faults, Th stages of a bearing fault, Demodulation and bearing analysis, The Shock Pulse Method Hydraulic and Aerodynamic faults, Diagnosing pumps, fans, compressors and recipro machines, Diagnosing coupling and belt drive faults Laboratory: Learning practical aspects of machine diagnostics. 1. Vibration measurem- machine diagnostics; 2. Acoustic measurements in machine diagnostics; 3. Diagno- gigacycle fatigue process; 4. Analysis of non-stationary processes in rotating machi Diagnostics of roller bearings using LabVIEW environment; 6. Fault detection in shaft be using database and simulation model.				ng machinery like: sing misalignment, nd journal bearing g faults, The nine se Method (SPM), and reciprocating agnosing gearbox measurements in ; 3. Diagnosis of ting machines; 5. n in shaft bearings			
Methods a	f examination o	laboratory experim	nental study				
Code	Evaluation me	thods					
Knowleda	<i>e</i>						
W01	Exam. test befor	re admitting to exer	cises, evaluation of	reports.			
W02	Exam, test befor	re admitting to exer	cises, evaluation of	reports.			
Skills	,,						
U01	Written tests						
U02	Written tests						
Social Con	npetences						
K01	Test before adm	nitting to exercises,	evaluation of task e	xecution and report	evaluation.		
K02	Exam, test befor	re admitting to exer	cises, evaluation of	reports.			
Evaluation methods		Projects: preparing project and homework which needs to utilize practical ability to solve simple problems as examples of theory presented within the lecture. Attestation of class exercises. Lecture: written examination on skills and knowledge concerning the scope of the course					
Exam		No					
Reference	es	Radkowski S.: Wik Radom 2002,	oroakustyczna diag	nostyka uszkodzeń	niskoenergetycznyc	h, ITE Warszawa-	
Subject website		http://www.mech Materials available class.	atronika.simr.pw.ec e in intranet after lo	lu.pl gging in. Login and	password will be gi	ven during the 1st	
D. Studer	t's contributi	on					
Number	of ECTS	2					
Number	of hours of	1) Number of cont	act hours- 32 includ	ling:			
student's	work	a) lecture - 15 h.		ō.			
Statent S		b) laboratory - 15 h,					

connected with achieving learning outcomes:	 c) consultations - 2 h. 2) Student's individual work 25 hours, including: a) 5 h - student's current preparation for classes, b) 5 h - literature study, c) 5 h - preparing for test, d) 10 h - preparing reports. 3) TOTAL - 57 h 			
Number of ECTS points for classes requiring direct participation of members of academic staff:	 a) lecture - 15 h, b) laboratory - 15 h, c) consultations - 2 h. 			
Number of ECTS points obtained by a student within practical	 1 ECTS point - student's individual work 25 hours, including a) participation in laboratory exercises - 15 h; b) preparing laboratory report - 10 h. 			
E. Additional information				
Comments	-			
Update date	3.10.2022 r.			

Descriptio	n of a subject				
Subject co	ode				
Subject		INTERIM PROJECT II			
Subject v	ersion	2022/23			
A. Placing	the subject wit	hin the study system			
Level of s	tudy	II degree			
Form of s	tudy	Full-time study			
Field of s	tudy	Mechanical Engineering			
Profile of	study	General academic			
Degree p	rogram	Advanced Machinery and Vehicles Engineering			
Supervisi	ng unit	Faculty of Automotive and Construction Machinery Engine	eering		
Performi	ng unit	Faculty of Automotive and Construction Machinery Engine	eering		
Subject co	oordinator				
B. Genera	al characterist	ics of the subject			
Subject k	ind	Specialised			
Subject le	Subject level Intermediate				
Subject g	roup	Elective			
Language instructio	e of	English			
Nominal	semester	3			
Course d academic	elivery in the year	Winter			
Pre-requi	sites	-			
Limit of students	number of	30			
C. Learni	ng outcomes a	nd the manner of conducting classes			
Aim of th	e subject	The aim of the subject is student's completion of the interior	m thesis.		
Subject ou	tcomes				
Code Description of the outcomes Reference bearing outcomes learning outcomes learning outcomes learning bearing beari			Reference to learning outcomes in the learning area	Learning outcomes for field of study	
Knowledg	e				
W01	Knows how to or rules and laws of the second	obtain data from literature; can evaluate the operation of concerning intellectual property protection.	I.P7S_WG.o III.P7S_WG.o	K_W16 K_W17	
-					

Skills						
U01	Can design a si	simple device, system or process, using proper methods,			K_U01	
	techniques and	nd tools, considering the use of proper materials and		I.P7S_UW.o	K_U03	
	technologies ne	cessary in the produ	iction process.		III.P75_0W.0	K_005 K_008
U02	Can perform a solutions or pro	Can perform an initial economic analysis of designed construction I.P7S_UW.o III.P7S_UW.o				K_U07
U03	Can obtain da	ta from literature	and data bases,	can evaluate the		K_U14
	operation of ru	les and laws of inte	ellectual property p	protection and can	I.P7S_UW.o	K_U15
	disadvantages of	of different solutions	entation discussing	g advantages and		K_U17 K_U18
	uisauvaittages c	of uniter ent solutions			1.175_0K	K U20
Social Con	npetences					
K01	Is aware of the mechatronics of	e role of a graduat fvehicle and constru	te in conveying the action machinery to	e achievements in the society.	I.P7S_KO I.P7S_KR	K_K01
Form of	classes and	Lecture	Exercises	Laboratory	Proiect	Computer classes
their dura	ation	-	-	-		
Timetable	S	0	0	0	5	0
Throughou	ut the semester	0	0	0	75	0
T		The autient in -1 1	a atudant'a	oult in the correct		the interim the
Learning	content	in agreement with student's field of s of technical knowle	h the Thesis Super tudy. It should refer edge gained by a stu	visor. Topic of the r to general-enginee ident up to this mon	e thesis ought to b ring issues and sho nent.	e connected with uld enable the use
Learning	methods	preparing a projec	t			
Methods o	of examination o	f learning outcome	25			
Code	Evaluation met	thods				
Knowledg	e					
W01	Interim thesis					
Skills	1					
U01	Evaluation of th	e interim thesis				
002	Evaluation of th	e interim thesis				
003	Evaluation of th	e interim thesis				
Social Con	npetences	1 .				
K01	Evaluation of th	e interim thesis				
Evalvation	n mathada	Evolution of the i	toning the sole. Inteni	un theodia		
Evaluation	n methous	Evaluation of the n	iterini tilesis. Interi			
Exam		References chosen by a student in agreement with the Thesis Supervisor within the scope				
Reference	es	connected with the topic of the thesis.				
Subject w	vebsite	-	•			
D. Studer	nt's contribution	on				
Number	of ECTS	6				
points						
Number o	of hours of	1) Number of cont	act hours - 75 hours	of a project.		
student's	work	2) Student's own work – 35 hours, including:				
connected	d with	a) literature study: 10 hours.				
achieving	learning	DJ WORK ON PREPARING THE PROJECT: 25 NOURS.				
outcomes	S:					
Number of ECTS points 3 ECTS points – number of contact hours - 75 hours of a project.						
for class	ses requiring					
direct participation of						
staff:	of academic					
Number of	of ECTS points	3 ECTS points - 11	0 hours of student's	work, including:		
obtained	by a student	a) participation in	project practicals - 2	/ 5 nours;		
within pr	actical	c) literature study	10 hours	110415,		
E. Additio	E. Additional information					

Comments	-
Update date	3.10.2022 r.

Descriptio	n of a subject					
Subject co	ode					
Subject		DIPLOMA SEMINAR				
Subject v	ersion	2022/23				
A. Placing	the subject wit	hin the study syste	em			
Level of s	tudy	II degree				
Form of s	tudy	Full-time study				
Field of s	study Mechanical Engineering					
Profile of	of study General academic					
Degree p	rogram	Advanced Machine	ery and Vehicles Eng	gineering		
Supervisi	ng unit	Faculty of Automo	tive and Construction	on Machinery Engin	eering	
Performi	ng unit	Faculty of Automo	tive and Construction	on Machinery Engin	eering	
Subject co	oordinator					
B. Genera	al characterist	ics of the subject	t			
Subject k	ind	Specialised				
Subject le	evel	Basic				
Subject g	roup	Obligatory				
Language instructio	e of on	English				
Nominal	semester	4				
Course d	elivery in the	Summer				
academic	year					
Pre-requi	isites	-				
Limit of	number of	30				
students		1.1				
C. Learni	ng outcomes a	na the manner of	of conducting clas	SSES	a unacontation Duon	aning students for
Aim of th	e subject	diploma exam.			a presentation. Prep	
Subject ou	tcomes					
Code	e Description of the outcomes Learning outcomes in the learning area				Learning outcomes for field of study	
Knowledg	e					
W01	Student who ha and presenting she also has ba property resour	as passed the subje its results in a clea sic knowledge in th rces management.	ct knows rules for ar and understanda ae area of patent lav	M.Sc. thesis layout ble manner. He or ws and intellectual	I.P7S_WK	K_W16
Skills						
U01	Student can: •Analyze the state of knowledge of the scientific literature and other sources recommended for a given topic, I.P7S_UW.o K_U15 •Critically evaluate the knowledge and formulate the results in the form of a short report I.P7S_UW.o K_U15					
U02	Can practically a	apply rules concern	ing intellectual prop	perty protection.	I.P7S_UW.o	K_U15
U03	Student can pr defend the assu	epare and give pr mptions formulated	esentation on a giv l in the presentatior	ven topic and can n.	I.P7S_UW.o III.P7S_UW.o	K_U17 K_U20
U04	Student can participate in a factual discussion on a given subject. I.P7S_UW.o K_U15 III.P7S_UW.o III.P7S_UW.o K_U17					
Form of their dura	classes and ation	Lecture	Exercises	Laboratory	Project	Computer classes

Timetables		0	2	0	0	0	
Througho	ut the semester	0	30	0	0	0	
Learning content		Practicals: Requirements for M.Sc. thesis. Student's own contribution. Rules for preparing Diploma Thesis Sheet. General structure and content of particular parts of diploma thesis. Rules for editing diploma thesis and for using proper terminology. Formulating tasks, aim and scope of diploma thesis. Preparing synopsis and references. Abiding by copyright laws. Diploma thesis aesthetics. Rules for conducting diploma exam. Ruled for conducting factual discussions. Rules for preparing diploma presentation: number and layout of slides, their content and coherence. Rules for giving a presentation					
Learning	methods	multimedia presen	tation				
Methods of	of examination o	f learning outcome	es anticipation de la constante				
Code	Evaluation met	thods					
Knowledg	le						
W01	Evaluation of pr	resentation					
Skills							
U01	Evaluation of pr	resentation					
U02	Evaluation of pr	resentation					
U03	Evaluation of pr	resentation					
U04	Evaluation of pr	esentation					
Evaluatio	n methods	Evaluation of the presentation					
Exam		No					
Referenc	es	Materials in English will be shared electronically.					
Subject w	vebsite	-					
D. Studer	nt's contribution	on					
Number points	of ECTS	2					
Number	of hours of	1) Number of conta	act hours – 31 h, inc	luding:			
student's	work	a) practicals – 30 h.;					
connecte	d with	b) consultations – 1 h					
achieving	learning	2) Student's own work – 20 h, including:					
outcome	5:	a) literature study	– 10 h;	10 h			
		b) student's preparation for tutorials – 10 h					
Number	of FCTS points	1.2 ECTS points - r	umber of contact h	ours – 31 hours, inc	luding:		
for class	ses requiring	a) practicals – 30 h	;				
direct na	rticination of	b) consultations – 1 h					
members	of academic						
staff.							
Number of FCTS points		1.6 ECTS points – 4	0 hours, including:				
obtained	by a student	a) practicals – 30 h	;				
within pr	actical	b) student's prepar	ration for tutorials -	- 10 h			
E. Additi	onal informati	on					
Commen	ts	-					
Update da	Jpdate date 3.10.2022 r.						

Description of a subject				
Subject code				
Subject	MASTER OF SCIENCE THESIS			
Subject version 2022/23				
A. Placing the subject wit	A. Placing the subject within the study system			
Level of study	II degree			
Form of study	Full-time study			
Field of study	Mechanical Engineering			

Profile of	e of study General academic						
Degree p	ogram Advanced Machinery and Vehicles Engineering						
Supervisi	ng unit	g unit Faculty of Automotive and Construction Machinery Engineering					
Performi	Performing unit Faculty of Automotive and Construction Machinery Engineering						
Subject co	ordinator						
B. Genera	al characterist	ics of the subiect	t				
Subiect k	ind	Specialised	-				
Subject le	evel	Advanced					
Subject g	roup	Elective					
Language	of	English					
instructio	on						
Nominal	semester	4					
Course d	elivery in the	Summer					
academic y	year						
Pre-requi	sites	-					
Limit of	number of	30					
students							
C. Learni	ng outcomes a	nd the manner o	of conducting clas	sses			
Aim of the	e subject	The aim of the sub	ject is student's exe	cution of an M.Sc. th	esis		
Subject ou	tcomes	1					
					Reference to	Learnina	
Code	Description of	the outcomes			learning	outcomes for	
					outcomes in the	field of study	
Knowleda	ρ				learning area		
W01	Knows how to	obtain data from lit	terature and data h	ases: can evaluate			
	the operation	of rules and lav	vs concerning int	ellectual property	LP7S WK	K W16	
	protection.	or raios and far		encoulai property			
W02	Knows the safet	ty methods in design	1.				
					I.P/S_WG.0	K_W15	
Skills							
U01	Can design a si	imple device, system	m or process, using	g proper methods,		K_U01	
	techniques and	l tools, considerin	g the use of prop	per materials and		K_U03	
	technologies ne	cessary in the produ	action process.			K_U04	
					I.P7S_UW.o	K_005	
					III.P7S_UW.o	K_000	
						K_010 K U11	
						K_U12	
						K_U13	
U02	Can perform a solutions or pro	an initial economi ocesses.	c analysis of desig	gned construction	I.P7S_UW.o	K_U07	
U03	Can obtain data	from literature, da	ta bases, and other	sources within the		K_U14	
	scope of the fi	ield of study; can	interpret and criti	cally evaluate the	I.P7S_UW.o	K_U15	
	obtained data	as well as draw c	onclusions and jus	stify opinions; can	III.P7S_UW.o	K_U17	
	evaluate the o	operation of rules	and laws of int	ellectual property	I.P7S_UK	K_U18	
	protection; can	prepare a synopsis	of the M.Sc. thesis ir	i English.	I.P/5_00	K_019 K_U21	
Social Con	nnetences					K_021	
K01	Is aware of the	e role of a graduat	te in conveying th	e achievements in	LP7S KO		
nor	mechatronics of	f vehicle and constru	uction machinery to	the society.	I.P7S KR	K_K01	
			y vv	- y-	I.P7S_KK	к_К02	
Form of	classes and	Locturo	Evereises	Laboratory	Droject	Computer classes	
their dura	ation	Lecture	Exercises	Laboratory	Fioject	computer classes	
Timetable	S	0	0	0	18	0	
Throughout the semester000				270	0		

Learning content		The subject comprises student's own work in the scope indispensable to execute an M.Sc. thesis established in agreement with the Thesis Supervisor. Topic of the thesis has to be connected with student's field of study. M.Sc. thesis ought to exhibit in-depth, basic theoretical and experimental knowledge in a given domain, and the ability to solve problems requiring th application of modern methods from the area of theoretical and empirical analyses. The object of the thesis may be especially: solving a computational, project or technological problem c solving a particular part of a bigger project, establishing or significantly improving an existin research, measurement or analytical method, performing a research task. M.Sc. thesis ought t contain new results of analyses, experimental or theoretical research, or theoretical inquirie or a new solution to a chosen problem within student's field of study.				
Learning	methods	preparing the M.Sc. thesis				
Methods of	of examination o	f learning outcomes				
Code	Evaluation me	thods				
Knowledg	e					
W01	M.Sc. thesis					
Skills						
U01	M.Sc. thesis					
U02	M.Sc. thesis					
U03	M.Sc. thesis					
Social Con	npetences					
K01	M.Sc. thesis					
Evaluation	n methods	M.Sc. thesis				
Exam		No				
Reference	es	References chosen by a student in agreement with the Thesis Supervisor within the scope connected with the topic of the M.Sc. thesis.				
Subject w	vebsite	-				
D. Studer	nt's contributi	on				
Number points	of ECTS	20				
Number o	of hours of	1) Number of contact hours - 270 h of the project.				
student's	work	2) student's own work – 250 h, including:				
connected	d with	a) literature study: 20 h				
achieving	learning	b) work on preparing M.Sc. thesis: 230 h				
outcomes	S:	3) TOTAL – 520 h				
Number of	of ECTS points	10.8 ECTS points - 270 h of the project.				
for class	ses requiring					
direct participation of						
members	of academic					
staff:						
Number of	of ECTS points	20 ECTS points - 500 h of student's own work, including:				
obtained	by a student	a) participation in project practicals - 270 h;				
within pr	actical	b) work on preparing M.Sc. thesis – 230 h				
E. Additio	onal informati	on				
Comment	ts	-				
Update da	te	3.10.2022 r.				

П

Description of a subject					
Subject code					
Subject	ADVANCED ALTERNATIVE FUELS FOR COMBUSTION ENGINES				
Subject version	2022/23				
A. Placing the subject wit	hin the study system				
Level of study	II degree				
Form of study	Full-time study				
Field of study	Mechanical Engineering				

Profile of	fstudy	General academi	c				
Degree p	rogram	Advanced Machinery and Vehicles Engineering					
Supervisi	ing unit	Faculty of Automo	ion Machinery Engine	eering			
Performing unit Faculty of Automotive and Construction Machinery Engi					eering		
Subject coordinator							
B. Genera	B. General characteristics of the subject						
Subject k	ind	Specialised					
Subject le	evel	Basic					
Subject g	roup	Elective B					
Language instructio	e of on	English					
Nominal	semester	2					
Course d	lelivery in the year	Summer					
Pre-requ	isites	Basic knowledge o	on general chemistr	ry and combustion en	gines (at a bachelor	's level).	
Limit of students	f number of	30					
C. Learni	ing outcomes a	nd the manner o	of conducting cla	asses			
Aim of th	Aim of the subject Aim of the subject To provide the students with knowledge on alternative fuels (other than gasoline and diesel oil) currently being considered for supplying combustion engines, in vehicular and stationary applications. After completing the course, the students should be able to characterize the most significant physical and chemical properties of alternative fuels, discuss and compare fuels in terms of their impact on operating and ecological performance of combustion engines, as well as describe environmental impacts of various fuels from Well-to-Wheel perspective. Learning to obtain information from literature and other properly chosen sources within the scope of the subject; integrating the obtained information, interpreting it and drawing conclusions; formulating and justifying opinions within the scope of application of alternative						
fuels in combustion engines.							
subject ou							
Code	Description of	the outcomes			Reference to learning outcomes in the learning area	Learning outcomes for field of study	
Code Knowledg	Description of	the outcomes			Reference to learning outcomes in the learning area	Learning outcomes for field of study	
Code Knowledg W01	Description of ge Has knowledge alternative fuels	the outcomes e in the field of s.	supplying combu	stion engines with	Reference to learning outcomes in the learning area	Learning outcomes for field of study K_W01	
Code Knowledg W01 W02	Description of pe Has knowledge alternative fuels Has detailed alternative fuels	the outcomes e in the field of s. knowledge of ph s.	supplying combu ysical and chem	stion engines with ical properties of	Reference to learning outcomes in the learning area	Learning outcomes for field of study K_W01 K_W11	
Code Knowledg W01 W02 W03	Description of a base of the second s	the outcomes e in the field of s. knowledge of ph s. within the scope of s to evaluate their combustion engine	supplying combusysical and chem of physical and cher influence on opera s.	stion engines with lical properties of emical properties of ating and ecological	Reference to learning outcomes in the learning areaI.P7S_WG.oI.P7S_WG.oI.P7S_WG.o	Learning outcomes for field of study K_W01 K_W11 K_W01	
Code Knowledg W01 W02 W03 Skills	Description of the second seco	the outcomes e in the field of s. knowledge of ph s. within the scope of s to evaluate their combustion engine	supplying combus ysical and chem of physical and che influence on opera s.	stion engines with ical properties of emical properties of ating and ecological	Reference to learning outcomes in the learning area I.P7S_WG.o I.P7S_WG.o	Learning outcomes for field of study K_W01 K_W11 K_W01	
Code Knowledg W01 W02 W03 Skills U01	<i>Description of</i> Has knowledge alternative fuels Has detailed alternative fuels Has knowledge alternative fuel performance of Is prepared to chosen sources obtained inforr and justify opin combustion eng	the outcomes e in the field of s. knowledge of ph s. within the scope of s to evaluate their combustion engine obtain information s within the scop nation, interpret it ions within the sco gines.	supplying combus ysical and chem of physical and che influence on opera s. n from literature e of the subject; and draw conclus pe of application o	stion engines with lical properties of emical properties of ating and ecological and other properly can integrate the sions and formulate f alternative fuels in	Reference to learning outcomes in the learning areaI.P7S_WG.oI.P7S_WG.oI.P7S_WG.oI.P7S_WG.o	Learning outcomes for field of study K_W01 K_W11 K_W01	
Code Knowledg W01 W02 W03 Skills U01	Description of a period of the second	the outcomes e in the field of s. knowledge of ph s. within the scope of s to evaluate their combustion engine obtain information s within the scop nation, interpret it ions within the sco gines. make a written and lternative fuels in co	supplying combusysical and chem of physical and chem influence on opera- s. n from literature e of the subject; and draw conclus pe of application o l oral presentation combustion engines	stion engines with ical properties of emical properties of ating and ecological and other properly can integrate the sions and formulate f alternative fuels in within the scope of	Reference to learning outcomes in the learning areaI.P7S_WG.oI.P7S_WG.oI.P7S_WG.oI.P7S_WG.oI.P7S_UW.o	Learning outcomes for field of study K_W01 K_W11 K_W01 K_U15	
Code Knowledg W01 W02 W03 Skills U01 U02 U02 U03	Description of a period of the second	the outcomes e in the field of s. knowledge of ph s. within the scope of s to evaluate their combustion engine obtain information s within the scop nation, interpret it ions within the scop gines. make a written and lternative fuels in co obtain knowledge o cation of alternativ ions for self-study.	supplying combu- ysical and chem of physical and che influence on opera s. n from literature e of the subject; and draw conclus pe of application o l oral presentation ombustion engines n their own, withir e fuels in combust	stion engines with ical properties of emical properties of ating and ecological and other properly can integrate the sions and formulate f alternative fuels in within the scope of n the scope of issues ion engines and can	Reference to learning outcomes in the learning areaI.P7S_WG.oI.P7S_WG.oI.P7S_WG.oI.P7S_UW.oI.P7S_UW.oI.P7S_UW.oI.P7S_UW.o	Learning outcomes for field of study K_W01 K_W11 K_W01 K_U15 K_U15	
Code Knowledg W01 W02 W03 Skills U01 U02 U02 U03 Social Cor	Description of a pe Has knowledge alternative fuels Has detailed alternative fuels Has knowledge alternative fuel performance of Is prepared to chosen sources obtained inforr and justify opin combustion eng Knows how to application of a Knows how to related to appli establish direct mpetences	the outcomes e in the field of s. knowledge of ph s. within the scope of s to evaluate their combustion engine obtain information s within the scop nation, interpret it ions within the scop mate a written and lternative fuels in co obtain knowledge o cation of alternativ	supplying combu- ysical and chem of physical and che influence on opera s. n from literature e of the subject; and draw conclus pe of application o l oral presentation ombustion engines n their own, withir e fuels in combust	stion engines with ical properties of emical properties of ating and ecological and other properly can integrate the sions and formulate f alternative fuels in within the scope of n the scope of issues ion engines and can	Reference to learning outcomes in the learning areaI.P7S_WG.oI.P7S_WG.oI.P7S_WG.oI.P7S_WG.oI.P7S_UW.oI.P7S_UW.oI.P7S_UW.o	Learning outcomes for field of study K_W01 K_W11 K_W01 K_U15 K_U15 K_U15	
Code Knowledg W01 W02 W03 Skills U01 U02 U02 U03 Social Cor K01	Description of a pe Has knowledge alternative fuels Has detailed alternative fuels Has knowledge alternative fuel performance of Is prepared to chosen sources obtained inforr and justify opin combustion eng Knows how to application of a Knows how to application of a Knows how to application of a Knows how to related to appli establish direct mpetences Understands to	the outcomes e in the field of s. knowledge of ph s. within the scope of s to evaluate their combustion engine obtain information s within the scop nation, interpret it ions within the scop gines. make a written and lternative fuels in co obtain knowledge o cation of alternativ ions for self-study. he influence of gines on the enviro society.	supplying combus ysical and chem of physical and chef influence on opera s. In from literature e of the subject; and draw conclus pe of application o l oral presentation ombustion engines n their own, within e fuels in combust application of al nment and knows	stion engines with nical properties of emical properties of ating and ecological and other properly can integrate the sions and formulate f alternative fuels in within the scope of n the scope of issues ion engines and can lternative fuels in how to convey this	Reference to learning outcomes in the learning areaI.P7S_WG.oI.P7S_WG.oI.P7S_WG.oI.P7S_WG.oI.P7S_UW.oI.P7S_UW.oI.P7S_UW.oI.P7S_KO I.P7S_KR	Learning outcomes for field of study K_W01 K_W11 K_W01 K_U15 K_U15 K_W15 K_U15	
Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Cor K01 K02	Description of a pe Has knowledge alternative fuels Has detailed alternative fuels Has knowledge alternative fuel performance of Is prepared to chosen sources obtained inform and justify opin combustion eng Knows how to application of a Knows how to related to appli establish direct mpetences Understands t combustion eng information to s Can think and a	the outcomes e in the field of s. knowledge of ph s. within the scope of s to evaluate their combustion engine obtain information s within the scop nation, interpret it ions within the scop nation, interpret it ions within the scop sines. make a written and lternative fuels in co obtain knowledge o cation of alternativ ions for self-study. he influence of gines on the enviro society. ct in an entreprenet	supplying combu- ysical and chem of physical and che influence on opera s. In from literature e of the subject; and draw conclus pe of application o l oral presentation ombustion engines n their own, withir e fuels in combust application of al nment and knows urial manner.	stion engines with ical properties of emical properties of ating and ecological and other properly can integrate the sions and formulate f alternative fuels in within the scope of n the scope of issues ion engines and can lternative fuels in how to convey this	Reference to learning outcomes in the learning areaI.P7S_WG.oI.P7S_WG.oI.P7S_WG.oI.P7S_WG.oI.P7S_UW.oI.P7S_UW.oI.P7S_UW.oI.P7S_KO I.P7S_KRI.P7S_KO I.P7S_KRI.P7S_KO I.P7S_KR	Learning outcomes for field of study K_W01 K_W11 K_W01 K_U15 K_U15 K_U15 K_U15 K_U15 K_U15 K_U15	
Subject ofCodeKnowledgW01W02W03SkillsU01U02U03Social CorK01K02	Description of a pe Has knowledge alternative fuels Has detailed alternative fuels Has knowledge alternative fuel performance of Is prepared to chosen sources obtained inforr and justify opin combustion eng Knows how to application of a Knows how to related to appli establish direct mpetences Understands t combustion eng information to s Can think and a	the outcomes e in the field of s. knowledge of ph s. within the scope of s to evaluate their combustion engine obtain information s within the scop nation, interpret it ions within the sco gines. make a written and lternative fuels in co obtain knowledge o cation of alternativ ions for self-study. he influence of gines on the enviro society. ct in an entreprenet	supplying combus ysical and chem of physical and che influence on opera s. In from literature e of the subject; and draw conclus pe of application o l oral presentation ombustion engines n their own, within e fuels in combust application of al nment and knows urial manner.	stion engines with nical properties of emical properties of ating and ecological and other properly can integrate the sions and formulate f alternative fuels in within the scope of n the scope of issues ion engines and can lternative fuels in how to convey this	Reference to learning area outcomes in the learning area I.P7S_WG.o I.P7S_UW.o I.P7S_UW.o I.P7S_KO I.P7S_KO I.P7S_KO I.P7S_KO I.P7S_KO I.P7S_KO I.P7S_KO I.P7S_KO	Learning outcomes for field of study K_W01 K_W11 K_W01 K_U15 K_U15 K_U15 K_U15 K_U15 K_U15 K_U15	

their dura	ation							
Timetable	S	1	0	0	1	0		
Throughou	it the semester	15	0	0	15	0		
Throughou		10	Ū	0	10			
Learning content		 Organizational matters. Introduction to issues connected with engine fuels. General characteristics and classification of alternative fuels. Alcohol fuels (methanol, ethanol). Eters. Vegetable oils. Vegetable oil esters (FAME, FAEE). Liquefied petroleum gas (LPG). Natural Gas (CNG, LNG). Biogas. Synthetic fuels (GTL, CTL, BTL). Ammonia. Hydrogen. Well-to-Wheel analysis of alternative fuels. 						
Learning	methods	lecture presentation Project: preparing	on a construction of su	pplying combustior	engines with alter	native fuels.		
Methods o	f examination o	f learning outcome	es					
Code	Evaluation met	thods						
Knowleag	e Wuitton toot Du							
W01 W02	Written test. Pr	eparing a computer	program					
W02	Written test. Pr	eparing a computer	program					
WU5	written test. Pr	eparing a computer	program					
	Writton tost Dr.	oparing a computor	program					
1102	Written test. Pr	eparing a computer	program					
002	Written test. Pr	eparing a computer	program					
003	written test. Pr	eparing a computer	program					
VO1	Writton toot Dr	ananing a computer	nuagyam					
KU1 KO2	Written test. Pr	eparing a computer	program					
K02	Written test. Pr	eparing a computer	program					
Franki anti a		M						
Evaluation	n metnoas	written test. Preparing a project.						
Exam		NO 1 Diaband Fallman and Fallman Alternative Fuels and Adversed Webble Technologies						
References		 Richard Folkson, and Folkson. Alternative Fuels and Advanced Vehicle Technologies for Improved Environmental Performance: Towards Zero Carbon Transportation. Woodhead, 2014. Srivastava, S. P., and Hancsók, Jenő. "Alternative Fuels." Fuels and Fuel-Additives. Hoboken, NJ: John Wiley & Sons, 2014. 121-76. Abdul Karim, Zainal Ambri. Alternative Fuels for Compression Ignition Engines. Springer Singapore, 2018. Lefebvre, Arthur Henry, and Dilip R. Ballal. Gas Turbine Combustion: Alternative Fuels and Emissions. 3rd ed. Boca Raton [etc.]: CRC/Taylor & Francis Group, 2010. 						
Subject w	rebsite	-						
D. Studer	nt's contribution	on						
Number	of ECTS	3						
points								
Number of	of hours of	1) Number of contact hours – 40 h, including:						
student's work		a) practicals – 30 h.;						
connected with		2) Student's own y	10 vork 25 hindudir					
achieving	learning	2) literature study	-10 h	ig.				
outcomes:		b) student's prepa	- 10 II, ration for tutorials -	- 10 h:				
		c) preparation a p	roject15 h;	···,				
		3) TOTAL – 75 h						
Number o	of ECTS points	1.5 ECTS points – 1	number of contact h	ours – 40 hours, inc	luding:			
for class	ses requiring	a) practicals – 30 h	nours;					
direct pa	rticipation of	b) consultations –	10 hour					
members	of academic							

staff:				
Number of ECTS points obtained by a student within practical	 1.5 ECTS points - 35 h, including: a) student's preparation for tutorials - 10 h b) preparation a project 15 h; 			
-				
E. Additional information				
Comments	-			
Update date	3.10.2022 r.			

Description of a su	ıbject						
Subject code	code						
Subject		LOCAL MODELS OF LAYERED STRUCTURES					
Subject version		2022/23					
A. Placing the sul	bject wit	hin the study system					
Level of study		II degree					
Form of study		Full-time study					
Field of study		Mechanical Engineering					
Profile of study		General academic					
Degree program		Advanced Machinery and Vehicles Engineering					
Supervising unit	;	Faculty of Automotive and Construction Machinery Engine	eering				
Performing unit		Faculty of Automotive and Construction Machinery Engine	eering				
Subject coordina	ator						
B. General char	acterist	ics of the subject					
Subject kind		Basic					
Subject level		Intermediate					
Subject group		Elective B					
Language instruction	of	English					
Nominal semest	er	2					
Course delivery academic year	in the	Summer					
Pre-requisites		Strength of materials, theory of vibration, theory of ordina	ry differential equat	ions			
Limit of num	ber of	30					
students							
C. Learning out	comes a	nd the manner of conducting classes					
Aim of the subject Provide students with a local approach (several models) to describe the mechanical, static dynamic behavior of planar multilayer structures such as plates, bands and beams, with la free of limitations of geometric and physical parameters. Acquiring by the students the ski error-free coding of the computational algorithms. Evaluation of the impact of sele parameters of the structures considered on deflections, eigenfrequencies, logarit decrement and coincidence frequencies. Evaluation of the impact of edge boundary condi on the above mentioned computational characteristics							
Subject outcomes							
Code Descri	Description of the outcomes Description of the outcomes Descri						
Knowledge							
W01 He has about l	a detaile imitatior	d knowledge about local models of layered structures and as of their applications.	I.P7S_WG.o	K_W01			
W02 Has ki layered	nowledge d structu	e about potential applications of the local models of res.	I.P7S_WG.o	K_W11			
W03 He has proble beams	s a detai ms for t	led knowledge about transformations of the boundary he layered plates to analogous problems for strips and	I.P7S_WG.o	K_W01			

Skills			
U01	Is prepared to obtain information from literature and other properly chosen sources within the scope of the subject; can integrate the obtained information, interpret it and draw conclusions and formulate and justify opinions within the scope of the application of local models of boundary problems of layered structures.	I.P7S_UW.o	K_U15
U02	Knows how to make a written and oral presentation within the scope of local models of static and vibration problems of layered structures.	I.P7S_UW.o	K_U15
U03	Knows how to obtain knowledge on their own, within the scope of local models of layered structures and can establish directions for self-study.	I.P7S_UW.o	K_U15
Social Con	npetences		
K01	Understands the need for multi-layer structures in various technical fields and knows how to convey this information to society.	I.P7S_KO I.P7S_KR	K_K01
K02	Can think and act in an entrepreneurial manner.	I.P7S_KO I.P7S_KR	K_K01
	· · · · ·		

Form of classes and their duration	Lecture	Exercises	Laboratory	Project	Computer classes
Timetables	1	0	0	1	0
Throughout the semester	15	0	0	15	0

Learning content		Lecture.				
		1. Examples of applications of multilayer structures.				
		2. Kinematic models and fields of strains.				
		4. Local constitutive models of purely elastic layers.				
		5. Local constitutive models of viscoelastic layers.				
		6. Local, linear elasticity equilibrium equations and equations of motion.				
		7. Solutions to the local equilibrium equations.				
		8. Solutions to the local equations of motion.				
		9. Boundary problems of multilayer structures with edge boundary conditions of simple				
		supports.				
		10. Boundary problems of multilayer structures with edge technical boundary conditions.				
		11. Transformations of the plate boundary problems to the problems of band and then to				
		analogous problems of the beam.				
		Project				
		1. Static deflection of a rectangular, two-layer panel subjected to a uniformly distributed load.				
		2. Elgenfrequencies of the two-layer purely elastic panel.				
		3. Eigenfrequencies and the logarithmic decrement of the two-layer viscoelastic panel.				
		4. Coincidence frequencies of the two-layer plate.				
Learning	methods	lecture presentation				
		project: preparing 2 simulation projects and presentation of results				
Methods of	of examination o	f learning outcomes				
Code	Evaluation met	thods				
Knowledg	e					
W01	Written test. Pr	esentation, discussion				
W02	Written test. Pr	esentation, discussion				
W03	Written test. Pr	esentation, discussion				
Skills						
U01	Written test. Pr	esentation, discussion. Evaluation a project				
U02	Written test. Pr	esentation, discussion. Evaluation a project				
U03	Written test. Pr	esentation, discussion. Evaluation a project				
Social Con	npetences					
K01	Written test. Pr	esentation, discussion. Evaluation a project				
K02	Written test. Pr	esentation, discussion. Evaluation a project				
Evaluatio	n methods	Lecture - 1 test (written), Project – 1 report made by student				
Exam		No				
Reference	es	S. Karczmarzyk: An analytic model of flexural vibrations and the static bending of plane				
		viscoelastic composite structures. OWPW, Warsaw, 1999.				
Subject w	vebsite	-				
D. Studer	nt's contributi	on				
Number	of ECTS	3				

points	
Number of hours of	1) Number of contact hours - 30 hours of a practicals.
student's work	2) Student's own work – 30 hours, including:
connected with	a) literature study: 5 hours.
achieving learning	b) Work on preparing the project: 10 hours.
outcomes:	3) TUTAL – 75 hours.
Number of ECTS points	3 ECTS points – number of contact hours - 30 hours of a practicals.
for classes requiring	
direct participation of	
members of academic	
staff:	
Number of ECTS points	3 ECTS points - 30 hours of student's work, including:
obtained by a student	a) work on preparing the project – 30 hours;
within practical	b) literature study: 5 hours
E. Additional informati	on
Comments	-
Update date	3.10.2022 r.

Description of a subject						
Subject code	oject code					
Subject	MODELLING HYBRID DRIVES					
Subject version	2022/23					
A. Placing the subject w	thin the study system					
Level of study II degree						
Form of study	Full-time study					
Field of study	Mechanical Engineering					
Profile of study	General academic					
Degree program	Advanced Machinery and Vehicles Engineering					
Supervising unit	Faculty of Automotive and Construction Machinery Engin	eering				
Performing unit	Faculty of Automotive and Construction Machinery Engin	eering				
Subject coordinator						
B. General characteris	tics of the subject					
Subject kind	Basic					
Subject level	Intermediate					
Subject group	Elective B					
Language o	English					
instruction						
Nominal semester	2					
Course delivery in the	Summer					
academic year						
Pre-requisites	Mechanics, Hydraulic, Vehicles, Electric					
Limit of number o	30					
students						
C. Learning outcomes	and the manner of conducting classes					
Aim of the subject	Obtaining theoretical bases concerning hybrid devices in vehicles, as well as gaining knowledge					
	necessary to evaluate the influence energy distributions.					
	Learning to obtain information from literature and other property chosen sources within the scope of the subject; can integrate the obtained information interpret it and draw conclusions					
	formulate and justify opinions within the scope of the hybrid (hydrostatic and electric) drive					
	application in vehicles.	,				
Subject outcomes						
Code Description o	f the outcomes	Reference to learning outcomes in the learning area	Learning outcomes for field of study			

Knowledg	le					
W01	Has knowledge in the field of the construction of hybrid drive.				I.P7S_WG.o	K_W01
W02	Has detailed knowledge of hybrid drive in vehicles.				I.P7S_WG.o	K_W02
W03	Has knowledge of energy distril	within the scope of outions in a vehicle	hybrid drive to eva on its safety.	luate the influence	I.P7S_WG.o	K_W03
Skills						
U01	Is prepared to obtain information from literature and other properly chosen sources within the scope of the subject; can integrate the obtained information, interpret it and draw conclusions and formulate and justify opinions within the scope of the application of hybrid drive in vehicles				I.P7S_UW.o	K_U15
U02	Knows how to application of h	make a written and ybrid drive in vehic	oral presentation v les.	within the scope of	I.P7S_UW.o	K_U15
U03	Knows how to o related to app directions for se	bbtain knowledge of lication of hybrid elf-study.	n their own, within drive in vehicles	the scope of issues and can establish	I.P7S_UW.o	K_U15
Social Con	npetences					
K01	Understands th other technical society.	e influence of appli devices and know	cation of hybrid dri 's how to convey t	ve in vehicles, and his information to	I.P7S_KO I.P7S_KR	K_K01
K02	Can think and a	ct in an entrepreneu	ırial manner.		I.P7S_KO I.P7S_KR	K_K01
Form of	classes and	Lecture	Exercises	Laboratory	Project	Computer classes
their dura	ation					F
Timetable	S	1	0	0	1	0
Throughout	ut the semester	15	0	0	15	0
		 Discussing prop drive systems. Hydrostatic driv 4. Electric drive sy. Overview of solu Discussing issue Modelling a hydr Modelling an ele Modelling an ele Preparing proj 11. Analysis of pow Test. Students' 	erties of vehicle dr e systems of vehicles stems of vehicles an ations of vehicles wi s of control of hybri rostatic drive of a vehi cetric drive of a vehi cetric-hydrostatic hy ect works on a hybr ver and energy flow presentations.	ives. Advantages an es and machines. Id machines. th hybrid drives. d drives. ehicle. cle. cle. rbrid drive. id drive of a vehicle. in hybrid systems.	d disadvantages of	classic and hybrid
Learning	methods	lecture presentatio)n simulation project :	and presentation of	results	
Methods of	of examination o	f learning outcome	25	and presentation of		
Code	Evaluation met	thods				
Knowledg	ie					
W01	Written test. Pr	esentation, discussion	on			
W02	Written test. Presentation, discussion					
W03	Written test, Presentation, discussion					
Skills	1	,				
U01	Written test. Pro	esentation, discussion	on. Evaluation a pro	ject		
U02	Written test. Presentation, discussion. Evaluation a project					
U03	Written test. Pro	esentation, discussion	on. Evaluation a pro	ject		
Social Cor	npetences			, · ·		
K01	Written test. Pro	esentation. discussion	on. Evaluation a pro	ject		
K02	Written test. Pr	esentation, discussion	on. Evaluation a pro	ject		
			r			
Evaluatio	n methods	Lecture - 1 tests (w	vritten). Proiect – 2	report made by stud	lent	
Exam		No	,, -			
Linum	ino ino					

References	1. Szumanowski A. Hybrid-Electric Vehicle Drives Design; Institutefor Sustainable Technologies:
	Kadom, Poland, 2006.
	2. Khajepour A.; Fallach S.; Goodarrzi A. Electric and Hybrid Vehicles; Willey: Chichester, UK,
	2014.
	3. Wei L. Introductionto Hybrid Vehicle System Modeling and Control; John Wiley & Sons, Inc.:
	Hoboken, NJ, USA, 2013.
Subject website	-
D. Student's contribution	on
Number of ECTS	3
points	
Number of hours of	1) Number of contact hours - 30 hours of a practicals.
student's work	2) Student's own work – 45 hours, including:
connected with	a) literature study: 5 hours.
achieving learning	b) work on preparing the project 1 - 20 hours.
aution age	c) project 2 of drive system - 20 h
outcomes:	3) TOTAL – 75 hours.
Number of ECTS points	1,5 ECTS points – number of contact hours - 30 hours of a practicals.
for classes requiring	
direct participation of	
members of academic	
staff.	
Number of ECTS points	1.5 ECTS points - 30 hours of student's work including:
Number of ECTS points	a) work on proparing the project 25 hours:
obtained by a student	a) work on preparing the project = 25 nours,
within practical	
E. Additional informati	on
Comments	-
Update date	3.10.2022 r.

Description of a subject			
Subject code			
Subject	NUMERICAL METHODS IN MECHANICS		
Subject version 2022/23			
A. Placing the subject wit	hin the study system		
Level of study	II degree		
Form of study	Full-time study		
Field of study	Mechanical Engineering		
Profile of study	General academic		
Degree program	Advanced Machinery and Vehicles Engineering		
Supervising unit	Faculty of Automotive and Construction Machinery Engineering		
Performing unit	Faculty of Automotive and Construction Machinery Engineering		
Subject coordinator			
B. General characteristics of the subject			
Subject kind	Specialised		
Subject level	Intermediate		
Subject group	Elective B		
Language of	English		
instruction			
Nominal semester	2		
Course delivery in the	Summer		
academic year			
Pre-requisites	-		
Limit of number of	30		
students			
C. Learning outcomes a	ind the manner of conducting classes		
Aim of the subject	Mathematical foundations regarding the issues under consideration (algebra, analysis), knowledge of mechanics and strength of materials, basic knowledge of programming,		

Subject ou	Subject outcomes					
Code	Description of t	Description of the outcomes			Reference to learning outcomes in the learning area	Learning outcomes for field of study
Knowledg	e					
W01	Has a knowle necessary for fo to problems of r	knowledge in the field of mathematics and programming, ary for formulating and solving numerically complex tasks related plems of mechanics				K_W03 K_W05
W02	He knows the mathematical p	e basic methods and numerical techniques used to solve problems related to mechanics on a computer				K_W03 K_W05
Skills	ls					
U01 Can calculate on a computer (using the Scilab environment) solutions of exemplary problems from the field of mechanics, interpret obtained results and draw conclusions			I.P7S_UW.o III.P7S_UW.o	K_U01 K_U14		
U02	He can apply nu	merical methods to	solve engineering t	asks	I.P7S_UW.o III.P7S_UW.o	K_U01 K_U14
Form of	alaggag and					
their during	classes and	Lecture	Exercises	Laboratory	Project	Computer classes
There are a labor		1	0	0	1	0
Timetable	S	1	0	0	1	0
Inroughou	at the semester	15	0	0	15	0
errors, modeling of typical problems in mechanics 2) Roots of nonlinear equations (Bisect Newton-Raphson and False-Position methods), systems of nonlinear equations 3) Solution linear algebraic equations (Gauss and Gauss-Jordan elimination, matrix inversion, itera methods) 4) Interpolation (Lagrange and Newton polynomials) and approximation (Le Squares and linear regression) 5) Numerical integration (Trapezoidal rule, Newton-Co formulas and Gauss quadrature) 6) Numerical solution of eigenvalue problem (Power meth main idea of QR method) 7) Ordinary differential equations (Euler's method, Runge-K methods) and systems of equations Projects: 1) Introduction to programming in Scilab (or Matlab) 2) Algorithms for finding ro of a nonlinear equation, test of convergence (numerical example: equilibrium of a floa object) 3) Solution of a system of linear algebraic equations (numerical exam paproximation of experimental data using the least squares approach) 4) Determination eigenvalues and eigenvectors of a matrix (numerical example: eigenfrequencies eigenmodes of a system of vibrating masses) 5) Numerical solution of a system of ordir differential equations (numerical example: cantilever beam subjected to bending)Learning methodslecture presentation preparing a projectMethods of examination of learning outcomesproject			uations (Bisection, ons 3) Solution of nversion, iterative roximation (Least- ule, Newton-Cotes m (Power method, thod, Runge-Kutta as for finding roots rium of a floating merical example: Determination of nfrequencies and ystem of ordinary ding)			
Knowloda	2. auton met	nous				
W01	Lecture - test A	individual homewo	orks			
W02	Lecture - test, 4	individual homowy	nrks			
Skille						
	U01 Departs from calculations carried out on projects - 5 venewts					
1102	Reports from ca	leulations carried o	ut on projects - 5 re	aports		
002	אנייט איט איט איט איט איט איט איט איט איט					
Evaluation methods Evaluation of the homeworks and reports						
Fyam		No				
References		SS Rao Applied Numerical Methods for Engineers and Scientists Drontice Hall Drofessional				
Subject website		Technical Reference 2001				
D Student's contributio		n n				
Number	of ECTS	3				
Number	fhours	1) Number of cont	act hours 10 inclu	iding:		
student's	work	a) lecture -15 h				
connected	d with	b) projects – 15 h				
		c) consultations -	10 h			

achieving learning outcomes:	 2) Student's individual work - 30 hours, including: a) preparing for lectures and computer program - 20 h b) carrying out calculations and preparing reports - 10 h c) preparing for test - 5 h d) doing homework - 5 h 3) TOTAL - 80 h 	
Number of ECTS points for classes requiring direct participation of members of academic staff:	 1,5 ECTS points - number of contact hours - 40, including: a) lecture - 15 h b) computer laboratories - 15 h c) consultations - 10 h 	
Number of ECTS points obtained by a student within practical	 1,5 ECTS points - number of student's work - 40, including: a) preparing for lectures and computer program - 20 h b) carrying out calculations and preparing reports - 10 h c) preparing for test - 5 h d) doing homework - 5 h 	
E. Additional information		
Comments	-	
Update date	3.10.2022 r.	

Description of a subject	Description of a subject				
Subject code					
Subject	ACTIVE CONTROL OF VEHICLE VIBRATIONS				
Subject version	2022/23				
A. Placing the subject within the study system					
Level of study	II degree				
Form of study	Full-time study				
Field of study	Mechanical Engineering				
Profile of study	General academic				
Degree program	Degree program Advanced Machinery and Vehicles Engineering				
Supervising unit	Faculty of Automotive and Construction Machinery Engin	eering			
Performing unit	Faculty of Automotive and Construction Machinery Engin	eering			
Subject coordinator					
B. General characteris	3. General characteristics of the subject				
Subject kind	Basic				
Subject level	Basic				
Subject group	Elective B				
Language o instruction	English				
Nominal semester	2				
Course delivery in the academic year	the Summer				
Pre-requisites	Mechanics, Theory of Vibrations, Theory of Vehicle Mover	nent, Vehicles			
Limit of number o students	30				
C. Learning outcomes	and the manner of conducting classes				
Aim of the subject Obtaining theoretical bases concerning active and adaptive devices in vehicles, a gaining knowledge necessary to evaluate the influence of vibrations on vehicle struct passengers. Learning to obtain information from literature and other properly chosen sources w scope of the subject; can integrate the obtained information, interpret it and draw conformulate and justify opinions within the scope of the application of smart materials in			nicles, as well as cle structure and ources within the draw conclusions, rerials in vehicles.		
Subject outcomes					
Code Description o	f the outcomes	Reference to learning outcomes in the learnina area	Learning outcomes for field of study		

Knowledg	Knowledge					
W01	Has knowledge in the field of the construction of active and adaptive devices. I.P7S_WG.0 K_W01					
W02	Has detailed knowledge of active and adaptive devices in vehicles.				I.P7S_WG.o	K_W11
W03	Has knowledge within the scope of active and adaptive devices to evaluate the influence on protection of a vehicle construction and I.P7S_WG.o K_W01				K_W01	
Skills						
U01	Is prepared to obtain information from literature and other properly chosen sources within the scope of the subject; can integrate the obtained information, interpret it and draw conclusions and formulate and justify opinions within the scope of the application of smart materials in vehicles.				K_U15	
U02	Knows how to application of si	make a written and mart materials in ve	oral presentation v hicles and in road t	vithin the scope of raffic safety.	I.P7S_UW.o	K_U15
U03	Knows how to o related to appli directions for se	bbtain knowledge of cation of smart mat elf-study.	n their own, within erials in technology	the scope of issues and can establish	I.P7S_UW.o	K_U15
Social Con						
K01	understands th and other techn society.	e influence of appl ical devices and kno	ows how to convey	this information to	I.P7S_KO I.P7S_KR	K_K01
K02	Can think and a	ct in an entrepreneu	ırial manner.		I.P7S_KO I.P7S_KR	K_K01
Form of	classes and	Lecture	Exercises	Laboratory	Project	Computer classes
Timetable	ation	1	0	0	1	0
Throughou	it the semester	15	0	0	15	0
Throughou	at the semester	15	0	0	15	0
Learning	 Learning content 1. Organizational matters. Introduction to issues connected with smart materials. 2. Discussing properties. Advantages and disadvantages of smart materials in engineering solutions. 3. Review of application solutions of smart materials. Construction of energy-dissipating devices. 4. Application of smart materials in energy-dissipating systems. 5. Application of smart materials in control of construction vibrations. 6. Construction of mechanical systems with active and adaptive devices. 8. Discussing issues of control of mechanical systems with active and adaptive devices. 9. Modelling of adaptive and active mechanical systems using Simulink software. 10. Adaptive and active vehicle suspensions. 11. Application of smart materials in road traffic safety. 12. Test. Student presentations. 				als. als in engineering energy-dissipating Basics of design of devices. re.	
Methods	rning methods lecture presentation project of a controlled suspension system of a vehicle					
Code Evaluation methods						
Knowledg	2. a.					
W01	Written test. Presentation, discussion					
W02	Written test. Presentation, discussion					
W03	Written test. Presentation, discussion					
Skills						
U01	Written test. Presentation, discussion. Evaluation a project					
U02	Written test. Presentation, discussion. Evaluation a project					
U03	Written test. Presentation, discussion. Evaluation a project					
Social Con	npetences	,	· · · · · · · · · · · ·	,		
K01	Written test. Pro	esentation. discussion	on. Evaluation a pro	iect		
K02	Written test. Pr	esentation, discussion	on. Evaluation a pro	ject		
		, ==	r -			
Evaluation	n methods	Evaluation of the t	ests (written) and re	eports.		

Exam	No	
References	1. Sapiński B: Magnetorheological dampers in vibration control. Cracow AGH, 2006.	
	2. Goldasz J., Sapiński B.: Insight into Magnetorheological Shock Absorbers, Springer, 2015.	
Subject website	-	
D. Student's contributi	on	
Number of ECTS	3	
points		
Number of hours of	1) Number of contact hours - 30, including:	
student's work	a) lecture - 15 h.;	
connected with	b) project – 15 h;	
achieving learning	2) Student's own work:	
outcomes:	a) 15 h – literature studies,	
	b) 15 h – preparing for test from lectures/presentations,	
	c) 15 h – preparing project,	
	3) 101AL - 75 h	
Number of ECTS points	1 ECTS point – number of contact hours - 30, including:	
for classes requiring	a) lecture - 15 h.;	
direct participation of	b) project – 15 n;	
members of academic		
staff:		
Number of ECTS points 2 ECTS point - 45 h, including:		
obtained by a student	1) 15 h – preparing a project of a controlled suspension system,	
within practical	2) 15 h – preparing for a test/presentation	
	3) 15 h – preparing a project,	
E. Additional informati	on	
Comments	-	
Update date	3.10.2022 r.	

Description of a subject				
Subject code				
Subject	DESIGN OF AUTOMOTIVE SUSPENSIONS			
Subject version	2022/23			
A. Placing the subject wit	hin the study system			
Level of study	II degree			
Form of study	Full-time study			
Field of study	Mechanical Engineering			
Profile of study	General academic			
Degree program	Advanced Machinery and Vehicles Engineering			
Supervising unit	Faculty of Automotive and Construction Machinery Engineering			
Performing unit	Faculty of Automotive and Construction Machinery Engineering			
Subject coordinator				
B. General characterist	ics of the subject			
Subject kind	Basic			
Subject level	Intermediate			
Subject group	Elective B			
Language of	English			
instruction				
Nominal semester	2			
Course delivery in the academic year	Summer			
Pre-requisites	Knowledge of the issues of: general mechanics, machines dynamics and theory of vibrations of mechanical systems; construction of motor vehicles; basics of solid modelling of machines elements.			
Limit of number of students	30			
C. Learning outcomes a	and the manner of conducting classes			

Aim of the subject	Understanding the specifics of design calculations and geometric modeling of automotive suspension assemblies.
	Creating a mathematical model of vibrations of automobile and the geometric model of suspension construction.
	Awareness of the importance of the accuracy of building mathematical and geometric models in suspension design practice.
Subject outcomes	

Code	Description of the outcomes				Reference to learning outcomes in the learning area	Learning outcomes for field of study
Knowledg	е					
W01	Knows how to obtain data from literature; can evaluate the operation of rules and laws concerning intellectual property protection.				K_W16	
W02	Has broadened and deep knowledge in the field of advanced construction of automotive suspensions and modern methods of their design. I.P7S_WG.o K_W05				K_W05	
W03	Has basic knowledge in the field of methods, techniques and tools used to solve complex problems related to creation of automotive suspension structure. I.P7S_WK K_W11					
Skills						
U01	Student can ap based, advanced	ply in practice the d modeling of suspe	knowledge in the nsion structures of	field of computer- motor vehicles.	I.P7S_UW.o III.P7S_UW.o	K_U08
U02	Is able to plan suspension co conclusions.	n and carry out t mponent, interpre	he strength analy et the results an	sis of automotive nd draw proper	I.P7S_UW.o III.P7S_UW.o	K_U09
Social Con	npetences					
K01	Understands th understandable in the construct	he need to formula way the information ion of suspensions.	te and communica on and opinions on	te in a commonly the achievements	I.P7S_KO I.P7S_KR	K_K01
Form of their dura	classes and ation	Lecture	Exercises	Laboratory	Project	Computer classes
Timetables		1	0	0	1	0
Throughout the semester		15	0	0	15	0
Learning	 2. Description of vertical vibrations of automobiles suspensions. 2. Description of vertical vibrations of automobile with the use of mathematical model. 3. The spectrum of road unevenness and its application in modeling of vibration. 4. Eigenvalue frequency of the body and the condition of conjugation of vibrations of front and rear axle. 5. Selection of stiffness coefficients of suspension spring elements based on the criterion of driving comfort. 6. Design calculations for elastic elements (coil spring, torsion bar). 7. Basics of solid modeling using CAD system. 8. Introduction to the principles of building geometric models including parameterization. 9. Presentation of the features of elements built using solid geometric models. 10. Execution of construction documentation for selected element of suspension. 11. Execution of the assembly drawing of suspension assembly. 12. Basics of strength calculations using CAE system. 13. Strength calculations of guiding elements in automotive suspension (reaction rods, rockers) - FEM method. 14. Analysis of forces acting on the body from the side of suspension elements. 15. Simulation studies of curvilinear motion of automobile depending on the geometry and suspension stiffnees 			al model. on. ations of front and on the criterion of neterization. on. tion rods, rockers) the geometry and		
Learning methods lecture presentation						
Methods of examination of learning outcomes						
Code	Evaluation me	thods				
Knowledg	е					
W01	Colloquium, pro	oject				
W02	Colloquium, project					
W03	Colloquium, project					

Skills					
U01	Evaluation a project				
U02	Evaluation a project				
Social Con	ompetences				
K01	Evaluation a project				
Evaluatio	n methods	Evaluation of the 1 colloquium, 1 project. As part of the colloquium student must prove the knowledge of the issues mentioned in the content of education. As part of the project, student must prove that can prepare the construction documentation of the suspension element (eg. rocker) after checking its strength. It is necessary to pass at least a satisfactory grade both for the colloquium and the project. From these two partial grades (of the same weight), the arithmetic mean of the object is calculated.			
Exam		No			
Reference	es	 Bastow D., Howard G., Whitehead J.P. Car Suspension and Handling, 4th Edition, Wiley, UK, 2004. Halderman J.D. Automotive Steering, Suspension & Alignment (7th Edition) (Automotive Systems Books) 7th Edition, Pearson, 2016. Mitschke M., Wallentowitz H. Dynamik der Kraftfahrzeuge. 3rd Edition. Springer, 2014. Reimpell J., Stoll H., Betzler J. The Automotive Chassis: Engineering Principles 2nd Edition. Butterworth-Heinemann 2000. 			
Subject w	vebsite	-			
D. Studer	nt's contribution	on			
Number points	of ECTS	3			
Number of student's connecter achieving outcomes	of hours of work d with g learning S:	 Number of contact hours - 31, including: a) lecture -15 hours; b) project -15 hours; c) consultations - 1 hours; 2) Student's own work - 19 hours, including: a) 10 hours - ongoing preparation for lectures (literature analysis), b) 9 hours - preparing for the colloquium and for carrying out the project. c) 15 h - preparing project, 3) OVERALL - 75 hours. 			
Number of for class direct pa members staff:	of ECTS points ses requiring articipation of a of academic	 1.2 ECTS point - number of contact hours - 31, including: a) lecture -18 hours; b) project - 12 hours; c) consultations - 1 hours; 			
Number obtained within pr	of ECTS points by a student actical	1.8 ECTS point - 19 hours of student work, including:a) project implementation within contact hours - 10 hours;b) preparation of a report on the completed project - 24 hours.			
E. Additi	onal informati	on			
Comment Undate da	ts te	- 3 10 2022 r			
opuate ua					

Description of a subject					
Subject code					
Subject	WEB DATABASES				
Subject version	2022/23				
A. Placing the subject wit	A. Placing the subject within the study system				
Level of study	II degree				
Form of study	Full-time study				
Field of study	Mechanical Engineering				
Profile of study	General academic				
Degree program	Advanced Machinery and Vehicles Engineering				
Supervising unit	Faculty of Automotive and Construction Machinery Engineering				

Performi	Performing unit Faculty of Automotive and Construction Machinery Engin							
Subject c	Subject coordinator							
B. Genera	B. General characteristics of the subject							
Subject k	ind	Specialised						
Subject le	evel	Intermediate						
Subject g	roup	Elective B						
Language	e of	English						
instructio	on							
Nominal	semester	2						
Course d	elivery in the year	Summer						
Pre-requ	isites	Fundamentals of database language, web database progra	mming.					
Limit of students	f number of	30						
C. Learni	ng outcomes a	nd the manner of conducting classes						
Aim of th	e subject	Fundamentals of Web databases systems, commands, soft	ware used in every d	lay work.				
Subject ou	itcomes							
Code	Description of	the outcomes	Reference to learning outcomes in the learning area	Learning outcomes for field of study				
Knowledg	je							
W01	Has basic knowledge about web databases systems.		I.P7S_WG.o	K_W01				
W02	Has knowledge	of Web databases systems.	I.P7S_WG.o	K_W11				
W03	Has knowledge	about Databases scripts, commands	I.P7S_WG.o	K_W01				
Skills								
U01	Is prepared to obtain information from literature and other properly chosen sources within the scope of the subject; can integrate the obtained information, interpret it and draw conclusions and formulate and justify opinions within the scope of the application of web databases			K_U15				
U02	Knows how to Web databases	make a written and oral presentation within the scope of systems	I.P7S_UW.o	K_U15				
U03	Knows how to obtain knowledge on their own, within the scope of issues related to databases systems and can establish directions for self-study.							

Description of a subject	
Subject code	
Subject	CONTROL OF DRIVE SYSTEMS
Subject version	2022/23
A. Placing the subject wit	hin the study system
Level of study	II degree
Form of study	Full-time study
Field of study	Mechanical Engineering
Profile of study	General academic
Degree program	Advanced Machinery and Vehicles Engineering
Supervising unit	Faculty of Automotive and Construction Machinery Engineering
Performing unit	Faculty of Automotive and Construction Machinery Engineering
Subject coordinator	
B. General characterist	ics of the subject
Subject kind	Specialised
Subject level	Intermediate

Subject g	ct group Elective B					
Language	uage of English					
instructio	n					
Nominal semester 3						
Course d	elivery in the	Winter				
academic y	year					
Pre-requi	sites	-				
Limit of	number of	30				
students						
C. Learni	ng outcomes a	The secure size t	of conducting clas	SSES	l of duing quatoms	wa antinom on ta fan
AIM OI UN	e subject	drive systems, con Learning to obtain scope of the subject formulate and just	struction and analyse information from ct; can integrate the ify opinions within t	sis of drive systems, literature and othe obtained informati the scope of the con	automation of drive r properly chosen s ion, interpret it and trol of drive systems	sources within the draw conclusions,
Subject ou	tcomes					
Code	Description of t	the outcomes			Reference to learning outcomes in the learning area	Learning outcomes for field of study
Knowledg	е				1	
W01	Has knowledge	in the field of the co	ontrol of drive system	ms.	I.P7S_WG.o	K_W01
W02	Has detailed kn	owledge of the cont	rol of drive systems		I.P7S_WG.o	K_W11
W03	Has knowledge	within the scope of	the control of drive	systems.	I.P7S_WG.o	K_W01
Skills	<u> </u>					1
U01	Is prepared to obtain information from literature and other properly chosen sources within the scope of the subject; can integrate the obtained information, interpret it and draw conclusions and formulate and justify opinions within the scope of the use of the control of drive					K_U15
U02	Knows how to a the use of the co	make a written and ontrol of drive syste	oral presentation v	within the scope of	I.P7S_UW.o	K_U15
U03	Knows how to or related to the directions for se	obtain knowledge or use of the control elf-study.	n their own, within of drive systems	the scope of issues and can establish	I.P7S_UW.o	K_U15
Social Con	npetences	Shi Study!				1
K01 Understands the need to critically analyze of a content and appreciation of knowledge while solving engineering problems within the field of the control of drive systems, and the importance of a proper attitude while formulating and covering to a society in a commonly understandable manner information and opinions relating to achievements in the field of the control of drive systems, as well as other aspects of a mechanical engineer's activity			I.P7S_KO I.P7S_KR	K_K01		
K02	Can think and a	ct in an entrepreneu	ırial manner.		I.P7S_KO I.P7S_KR	K_K01
Form of their dura	classes and ation	Lecture	Exercises	Laboratory	Project	Computer classes
Timetable	S	1	0	0	1	0
Throughou	ut the semester	15	0	0	15	0
Learning content		 Organizational 1 Basic concepts 1 Requirements for 4 Construction and 5 Problems of dri 6 Automation of 6 Modulation of 6 Program modul 	matters. Introductio in drive systems. or drive systems. id analysis of drive s ve systems design. lrive systems. rders. ator.	on to issues connecto systems.	ed with the control o	of drive systems.

		9. Program implementation of a system.				
		10. Computer tasks and processor cards.				
		11. Simulation of drive systems.				
.	.1 1	12. Test. Student presentations.				
Learning	methods	lecture presentation				
Methods o	f examination o	f learning outcomes				
Code	Evaluation met	thads				
Knowleda	e					
W01	Written test. Pro	esentation, discussion				
W02	Written test. Pro	esentation, discussion				
W03	Written test. Pro	esentation, discussion				
Skills						
U01	Written test. Pr	esentation, discussion. Evaluation a project				
U02	Written test. Pr	esentation, discussion. Evaluation a project				
U03	Written test. Pr	esentation, discussion. Evaluation a project				
Social Con	npetences					
K01	Written test. Pr	esentation, discussion. Evaluation a project				
K02	Written test. Pro	esentation, discussion. Evaluation a project				
	·					
Evaluation	n methods	Evaluation of the test and project.				
Exam		No				
Reference	es	1.S.K Sul, Control of Electric Machine Drive Systems, Wiley – IEEE Press, 2011.				
		2.W. Leonard, Control of electrical drives, Springer Verlag, 3rd ed., 2001.				
		3.M. Tondos, W. Mysinski, Microcomputer-based control system for drives with resilient				
		couplings, Proc. of EPE'01, Graz, Austria, CD, 2001.				
		2002				
		5.K. T. Chau, Z. Wang, Chaos in electric drive systems: Analysis, Control and Application, Wiley-				
		IEEE Press, 2011.				
Subject w	vebsite	-				
D. Studen	nt's contribution	on				
Number	of ECTS	3				
points						
Number o	of hours of	1) Number of contact hours - 30, including:				
student's	work	a) lecture - 15 h;				
connected	d with	b) project – 15 h;				
achieving	learning	2) Student's own work:				
outcomes	S:	a) 15 h – literature studies;				
		b) 15 h – preparing for test from lectures/presentations;				
		c_{j} 15 n – preparing project,				
Numbor	of ECTS points	5 FOTAL = 7.5 II 1 FCTS point - number of contact hours - 30 including:				
for class	sec requiring	a) lecture – 15 h:				
direct no	rticipation of	b) project – 15 h;				
mombars of academic						
staff.						
Number of ECTS points		2 ECTS point - 45 h including				
obtained	hy a student	1) 15 h – preparing a project of the control of a drive system;				
within nr	actical	2) 15 h – preparing for a test/presentation;				
		3) 15 h – preparing project,				
E. Additio	onal informati	on				
Comment	S	-				
Update dat	te	3.10.2022 r.				

Descriptio	n of a subject						
Subject co	ode						
Subject		FLUID FLOW CO	FLUID FLOW COMPUTER MODELLING II				
Subject v	ersion	2022/23					
A. Placing	the subject wit	hin the study syste	m				
Level of s	tudy	II degree					
Form of s	tudy	Full-time study					
Field of st	tudy	Mechanical Engine	ering				
Profile of	study	General academi	c				
Degree pi	rogram	Advanced Machine	ery and Vehicles Eng	gineering			
Supervisi	ng unit	Faculty of Automot	tive and Constructio	on Machinery Engine	eering		
Performi	ng unit	Faculty of Automot	tive and Constructio	on Machinery Engine	eering		
Subject co	oordinator						
B. Genera	al characterist	ics of the subject					
Subject k	ind	Specialised					
Subject le	evel	Advanced					
Subject g	roup	Elective B					
Language instructio	e of on	English					
Nominal	semester	3					
Course d academic	elivery in the year	Winter					
Pre-requi	isites	Fluid Mechanics, T	hermodynamics, Hy	draulic and Pneum	atic Drives, Heat Tra	insfer	
Limit of	number of	30					
students							
C. Learni	ng outcomes a	nd the manner o	of conducting clas	sses			
Aim of the subject Acquiring advanced knowledge in the field of numerical modelling of fluid flow (Comput Fluid Dynamics) and the operation of the ANSYS Fluent program, including: creat numerical mesh, setting the solver, assigning boundary conditions, learning method verifying the correctness of the solution presentation of results.				uding: creating a ning methods for			
Subject ou	tcomes						
Code	Description of t	the outcomes			Reference to learning outcomes in the learning area	Learning outcomes for field of study	
Knowledg	e						
W01	Acquisition of k Acquisition of k obtained by var	nowledge in the fiel mowledge in the fie ious methods.	d of computer mode eld of comparative	elling of fluid flow. analysis of results	I.P7S_WG.o	K_W16	
Skills	·						
U01	Preparation for performing an individual simulation analysis. Building numerical model, carrying out calculations, verifying the correctness of obtained results interpreting results and draw conclusions				K_U08		
U02	Acquisition of compressible ga	of knowledge for performing an individual simulation for I.P7S_UW.o III.P7S_UW.o K_U09					
U03	Acquisition of k of technical rep	uisition of knowledge for presenting the obtained results in the form sechnical report.				K_U10	
Social Con	npetences						
K01	Understanding of using them knowledge to th	the use of modern o in various branche ne public.	computer methods s of industry. The	and the possibility ability to transfer	I.P7S_KO I.P7S_KR	K_K01	
Form of	classes and	Lecture	Exercises	Laboratory	Project	Computer classes	
their dura	ation	200000		Laboratory	. 10,000	computer classes	
Timetable	S	1	0	0	1	0	
Throughout the semester 15 0 0 15 0					U		

Learning content1. Organizational matters. Benefits and examples of advanced applications of the CFD modelling in industry. 2. Derivation of the compressible Navier-Stokes equations. 3. Derivation of the compressible energy equations. 4. Presentation of the basic principles of creating a numerical mesh. 5. Overview of possible boundary conditions. 6. Overview of methods to validate the solution and present the results. 7. Simulation analysis of gas expansion in de Laval nozzle and comparison with solution. 8. Aerodynamic simulation analysis of the object for supersonic velocity. Analysi wave. 9. Simulation analysis of gas flow in the mobile valve system. Learning dynamic mes 11. Simulation analysis of isobaric combustion.Learning methodslecture presentation	numerical analytical s of shock 1 technics.			
preparing a project				
Methods of examination of learning outcomes				
Code Evaluation methods				
Knowledge				
wol Execution of two different simulation projects				
Skills				
U01 Presentation, discussion, project U02 Presentation discussion, project				
U02 Presentation, discussion, project U03 Presentation discussion, project	russion, project			
Social Competences				
K01 Presentation discussion project				
<i>Evaluation methods</i> Evaluation of the test and project.				
Exam No				
References 1. ANSYS Fluent - User's Guide				
References 1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2002				
References 1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2003 Subject website				
References 1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2003 Subject website - D. Student's contribution				
References 1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2003 Subject website - D. Student's contribution Number of ECTS 3				
References 1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2007 Subject website - D. Student's contribution Number of ECTS 3 points -				
References 1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2007 Subject website - D. Student's contribution Number of ECTS 3 points 1) Number of contact hours - 30 hours (15 h of lecture and 15				
References 1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2007 Subject website - D. Student's contribution Number of ECTS 3 points 1) Number of contact hours - 30 hours (15 h of lecture and 15 student's work 00 practicals).				
References 1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2007 Subject website - D. Student's contribution Number of ECTS 3 points 1) Number of contact hours - 30 hours (15 h of lecture and 15 student's work of practicals). connected with 2) Student's own work - 30 hours, including: p) literature studer 15 hours				
References 1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2007 Subject website - D. Student's contribution Number of ECTS 3 points 1) Number of contact hours - 30 hours (15 h of lecture and 15 student's work of practicals). connected with 2) Student's own work - 30 hours, including: achieving learning a) literature study: 15 hours. b) Work on preparing the project: 15 hours				
References1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2007Subject website-D. Student's contributionNumber of ECTS3points1) Number of contact hours - 30 hours (15 h of lecture and 15 of practicals).Number of hours of student's work connected with achieving learning outcomes:1) Number of contact hours - 30 hours, including: a) literature study: 15 hours. b) Work on preparing the project: 15 hours. c) project - 15 h:				
References1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2007Subject website-D. Student's contributionNumber of ECTS3points1) Number of contact hours - 30 hours (15 h of lecture and 15 of practicals).Number of hours of student's work connected with achieving learning outcomes:1) Number of contact hours - 30 hours, including: a) literature study: 15 hours. b) Work on preparing the project: 15 hours. c) project - 15 h; 3) TOTAL - 75 hours.				
References1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2007Subject website-D. Student's contributionNumber of ECTS3points1) Number of contact hours - 30 hours (15 h of lecture and 15 of practicals).Number of hours of student's work connected with achieving learning outcomes:1) Number of contact hours - 30 hours, including: a) literature study: 15 hours.Number of ECTS points3) TOTAL - 75 hours.Number of ECTS points1 ECTS points - number of contact hours - 30 hours (15 h of lecture and 15 of practical)				
References1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2007Subject website-D. Student's contributionNumber of ECTS3points1) Number of contact hours - 30 hours (15 h of lecture and 15 of practicals).Number of hours of student's work connected with achieving learning outcomes:1) Number of contact hours - 30 hours, including: a) literature study: 15 hours. b) Work on preparing the project: 15 hours. c) project - 15 h; 3) TOTAL - 75 hours.Number of ECTS points for classes requiring1 ECTS points - number of contact hours - 30 hours (15 h of lecture and 15 of practical a literature study: 15 hours. b) Work on preparing the project: 15 hours. c) project - 15 h; 3) TOTAL - 75 hours.				
References1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2007Subject website-D. Student's contributionImage: State of the state o				
References1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2007Subject website-D. Student's contributionImage: State of the state o	 als).			
References1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2003Subject website-D. Student's contributionNumber of ECTS points3Number of hours of student's work connected with achieving learning outcomes:1) Number of contact hours - 30 hours (15 h of lecture and 15 	 als).			
References1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2003Subject website-D. Student's contributionNumber of ECTS points3Number of hours of student's work connected with achieving learning outcomes:1) Number of contact hours - 30 hours (15 h of lecture and 15 				
References1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2007Subject website-D. Student's contributionNumber of ECTS3points1) Number of contact hours - 30 hours (15 h of lecture and 15 of practicals).Number of hours of student's work connected with achieving learning outcomes:1) Number of contact hours - 30 hours, including: a) literature study: 15 hours.Number of ECTS points3) TOTAL - 75 hours.Number of ECTS points1 ECTS points - number of contact hours - 30 hours (15 h of lecture and 15 of practical b) Work on preparing the project: 15 hours. c) project - 15 h; 3) TOTAL - 75 hours.Number of ECTS points for classes requiring direct participation of members of academic staff:2 ECTS points - 45 hours of student's work, including: a) work on preparing the project - 15 hours; b) Work on preparing the project - 15 hours; b) work on preparing the project - 15 hours; b) b) literature study: 15 hours is b) literature study: 15 hours; b) literature study: 15 hours;	 als).			
References1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 2007Subject website-D. Student's contributionNumber of ECTS3points1) Number of contact hours - 30 hours (15 h of lecture and 15 of practicals).Number of hours of student's work 	 ۱s).			
References 1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 200 Subject website - D. Student's contribution Number of ECTS 3 points 1) Number of contact hours - 30 hours (15 h of lecture and 15 of practicals). Connected with achieving learning outcomes: 2) Student's own work - 30 hours, including: a) literature study: 15 hours. b) Work on preparing the project: 15 hours. c) project - 15 h; 3) TOTAL - 75 hours. Number of ECTS points for classes requiring direct participation of members of academic staff: 2 ECTS points - 45 hours of student's work, including: a) work on preparing the project - 15 hours; 2 ECTS points - 45 hours of student's work, including: obtained by a student within practical 2 biterature study: 15 hours; b) literature study: 15 hours; 10 biterature study: 15 hours; b) literature study: 15 hours; 10 biterature study: 15 hours; c) 15 h - preparing a project, 15 hours; c) 15 h - preparing a project, 15 hours;	 ۱۱۵).			
References 1. ANSYS Fluent - User's Guide 2. Blazek J. Computational Fluid Dynamics: Principles and Applications. Elsevier, 200 Subject website - D. Student's contribution Number of ECTS 3 points 1) Number of contact hours - 30 hours (15 h of lecture and 15 of practicals). Connected with achieving learning outcomes: 2) Student's own work - 30 hours, including: a) literature study: 15 hours. b) Work on preparing the project: 15 hours. c) project - 15 h; 3) TOTAL - 75 hours. Number of ECTS points for classes requiring direct participation of members of academic staff: 2 ECTS points - 45 hours of student's work, including: a) work on preparing the project - 15 hours; a) work on preparing the project - 15 hours. Number of ECTS points 2 ECTS points - 45 hours of student's work, including: a) work on preparing the project - 15 hours; a) work on preparing the project - 15 hours; b) literature study: 15 hours c) 15 h - preparing a project, E. Additional information -	 als).			

Descriptio	n of a subject						
Subject co	ode						
Subject		APPLIED GAS DYNAMICS AND TURBOCHARGING SYSTEMS FOR INTERNAL					
		COMBUSTION ENGINES					
Subject v	ersion	2022/23					
A. Placing	the subject wit	hin the study syste	em				
Level of s	tudy	II degree					
Form of s	tudy	Full-time study					
Field of st	tudy	Mechanical Engine	ering				
Profile of	study	General academi	с				
Degree p	rogram	Advanced Machine	ery and Vehicles Eng	gineering			
Supervisi	ng unit	Faculty of Automot	tive and Constructio	on Machinery Engine	eering		
Performi	ng unit	Faculty of Automo	tive and Construction	on Machinery Engine	eering		
Subject co	oordinator						
B. Genera	al characterist	ics of the subject	t				
Subject k	ind	Specialised					
Subject le	evel	Intermediate					
Subject g	roup	Elective B					
Language instructio	e of	English					
Nominal	semester	3					
Course d	elivery in the year	Winter					
Pre-requi	isites	Basic knowledge o (at a bachelor's lev	of thermodynamics, rel)	fluid mechanics an	d internal combusti	ion engines theory	
Limit of students	number of	30					
C. Learni	ng outcomes a	nd the manner o	of conducting clas	sses			
Aim of th	e subject	Studying the theor taking place in the the theoretical kno	y of turbocharging turbocharging sys wledge into relevar	including fundamen stems of internal co nt practical cases.	tals of gas dynamic mbustion engines.	processes that are Transformation of	
Subject ou	tcomes			•			
Code	e Description of the outcomes				Reference to learning outcomes in the learning area	Learning outcomes for field of study	
Knowledg	e				<u>_</u>		
W01	Student who ha Dynamics gover	s passed the subject ning one-dimension	ct knows the fundar nal gas flow.	nental laws of Gas	I.P7S_WG.o	K_W03	
W02	Has knowledge of fundamental gas dynamic processes that are taking place in the compressor and turbine stage of turbocharging systems used in internal combustion engines. Has an applied knowledge in the field of simulations and testing of turbocharging systems.					K_W03 K_W05 K_W12	
Skills							
U01	Able to calculat compressor, tur	ble to calculate basic parameters which reflect performance of turbine, I.P7S_UW.o K_U01 pmpressor, turbocharger and intercooler. III.P7S_UW.o					
U02	Is able to conduct CFD analysis and estimate gas dynamic performance of the main components used in the turbocharging systems of internal combustion engines. I.P7S_UW.o III.P7S_UW.o K_U08					K_U08	
Social Con	npetences						
K01Has a critical approach in analysis of obtained CFD simulations results. Ability to deliver recommendations in design improvements based on the knowledge related to technical problems solving in machines and vehicles engineering.I.P7S_KO I.P7S_KRK_K01				K_K01			
	Ability to delive knowledge rela vehicles engine	ated to technical ering.	problems solving	in machines and	I.P75_KK		
	Ability to delive knowledge rela vehicles engine	ated to technical ering.	problems solving	in machines and	I.P75_KK		
Form of	Ability to delive knowledge rela vehicles engine classes and ation	ated to technical ering. Lecture	problems solving Exercises	in machines and Laboratory	Project	Computer classes	
Form of their dura Timetable	Ability to delive knowledge rela vehicles engine classes and ation	tecture 1	problems solving Exercises 0	in machines and Laboratory 0	Project 1	Computer classes 0	

Learning	content	 Lectures: Fundamentals of Gas Dynamics Fundamentals of turbocharging systems for ICE Turbocharging systems for ICE: current solutions and future trends CFD as an engineering tool for design and analysis of turbocharging systems Projects of 3D Flow simulations:
		 Flow analysis in the nozzles and diffusors Pressure drop losses calculations Intercooler efficiency calculations based on CFD analysis Flow analysis in the blade channel of the rotating impeller 3D simulations of the flow in the turbocharger's
Learning	methods	volutes preparing a project Project: Gas Dynamics System
Methods o	of examination o	f learning outcomes
Code	Evaluation met	thods
Knowledg	1e	
W01	Written test. Pr	eparing a project
W02	Written test. Pr	eparing a project
W03	Written test. Pr	eparing a project
Skills		
U01	Written test. Pr	eparing a project
U02	Written test. Pr	eparing a project
U03	Written test. Pr	eparing a project
Social Con	npetences	
K01	Written test. Pr	eparing a project
K02	Written test. Pr	eparing a project
Evaluatio	n mathads	Written test Dreparing a project
Evan	n methous	No
Deference	00	1 Fundamentals of Compressible Fluid Mechanics Minneapolis MN55414-2411 2013 400n
References		 Pundamentals of compressible Fluid Mechanics, Minicapolis, MiN33414-2411, 2015, 400p. Computational Fluid Dynamics Second Edition. T. J. CHUNG, Cambridge university press, 2010, 1034p. Fluid Mechanics and Thermodynamics of Turbomachinery Seventh Edition. University of Cambridge. UK, 2014, 535p. Michael J. Moran, Howard N. Shapiro. Fundamentals of engineering thermodynamics. John Wiley& Sons Ltd, England 2006 Herwood John B.: Internal combustion engine fundamentals. McGrew Hill 1998
Subiect w	vebsite	-
D. Studer	nt's contributio	on
Number	of ECTS	3
points		
Number of	of hours of	1) Number of contact hours – 40 h, including:
student's	work	a) practicals – 30 h.;
connecte	d with	b) consultations – 10
achieving	glearning	2) Student's own work – 35 h, including:
outcomes	5:	h) student's prenaration for tutorials $= 10 \text{ h}$
		c) preparation a project15 h;
NT I		3) TOTAL – 75 h
Number of	of ECIS points	1.5 EUTS points – number of contact nours – 40 nours, including:
dimention	ses requiring	h) consultations $= 10$ hour
arrect pa	inticipation of	
staff.	of academic	
Stall: Numbor	of ECTS points	15 ECTS points 25 h including
obtained	by a student	a) student's preparation for tutorials – 10 h
within pr	actical	b) preparation a project 15 h;
E. Additio	unai informati	ON
Commen	ts	-

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Description	n of a subject					
Subject co	code					
Subject	BODYWORK DESIGN					
Subject ve	ersion	rsion 2022/23				
A. Placing	the subject wit	hin the study system				
Level of s	tudy	II degree				
Form of s	tudy	Full-time study				
Field of st	tudy	Mechanical Engineering				
Profile of	study	General academic				
Degree pi	rogram	Advanced Machinery and Vehicles Engineering				
Supervisi	ng unit	Faculty of Automotive and Construction Machinery Engine	eering			
Performi	ng unit	Faculty of Automotive and Construction Machinery Engine	eering			
Subject co	oordinator					
B. Genera	al characterist	ics of the subject				
Subject ki	ind	Specialised				
Subject le	evel	Intermediate				
Subject gr	roup	Elective B				
Language instructio	e of on	English				
Nominal s	semester	3				
Course d	elivery in the	Winter				
academic y	year					
Pre-requi	re-requisites Construction Materials, Material Strength, Basics of Machine Construction, Manufact Techniques					
Limit of	number of	30				
students						
C. Learni	ng outcomes a	nd the manner of conducting classes				
Aim of the	e subject	Learning about support structures of vehicle bodywork. T machines and vehicles, as well as construction mate operation of support structures of vehicles. Learning to obtain information from literature and othe scope of the subject; can integrate the obtained informat and formulate and justify opinions within the scope of th structures	heoretical basics cor rials will enable to r properly chosen so ion, interpret it and e design of vehicle b	ncerning design of understand the ources within the draw conclusions odywork support		
Subject ou	tcomes	Structures.				
Code	Description of	the outcomes	Reference to learning	Learning outcomes for		
	. ,		outcomes in the learning area	field of study		
Knowleda	1e		icur ning ur cu			
W01	Knows how to design support structure of a vehicle		I.P7S_WG.o	K_W01		
W02	Has detailed kr vehicle bodywo	nowledge in the field of design of support structures of rk.	I.P7S_WG.o	K_W01		
W03	Knows how to c	lesign support structures of vehicle bodywork.	I.P7S_WG.o	K_W01		
Skills						
U01	Is prepared to obtain information from literature and other properly chosen sources within the scope of the subject; can integrate the obtained information, interpret it and draw conclusions and formulate and justify opinions within the scope of the design of vehicle bodywork current structures.			K_U15		
U02	Knows how to solution to a su	make a written and oral presentation of a prepared poort structure of a vehicle bodywork.	I.P7S_UW.o	K_U15		

U03	Knows how to pertaining to th for self-study	individually obtain e design of support	the scope of issues establish direction	I.P7S_UW.o	K_U15			
Social Con	npetences							
K01	Understands the influence of application of different solutions while designing bodywork and of application of materials on vehicle technical properties and knows how to convey this information to society							
K02	Can think and a	ct in an entreprenei	ırial manner		I.P7S_KO I.P7S_KR	К_К01		
Form of	classes and				_			
their dura	ation	Lecture	Exercises	Laboratory	Project	Computer classes		
Timetable	S	1	0	0	1	0		
Throughou	ut the semester	15	0	0	15	0		
Learning content		 Organizational r modelling in indus Derivation of the Derivation of the Presentation of the Presentation of the Overview of pos Overview of met Simulation analy Simulation analy Simulation analy Simulation analy Simulation analy Simulation analy 	natters. Benefits and try. e compressible Navi e compressible ener the basic principles sible boundary cond chods to validate the lysis of gas expans imulation analysis vsis of cavitation – le lysis of gas flow in t lysis of isobaric con	d examples of advar er-Stokes equations gy equations. of creating a numer ditions. e solution and prese sion in de Laval no of the object for si earning two phase fl he mobile valve syst obustion.	aced applications of a signal mesh. Int the results. Int the results.	the CFD numerical on with analytical Analysis of shock nic mesh technics.		
Loarning	mothodo	nrenaring a project						
Learning	methous	lecture presentation						
Methods o	of examination o	f learning outcome	?S					
Code	Evaluation met	thods						
Knowledg	e							
W01	Written test. Pr	esentation, discussi	on.					
W02	Written test. Pro	esentation, discussi	on.					
W03	Written test. Pro	esentation, discussi	on.					
Skills								
U01	Written test. Pr	esentation, discussi	on. Evaluation a pro	ject				
U02	Written test. Pro	esentation, discussi	on. Evaluation a pro	ject				
U03	Written test. Pr	esentation, discussi	on.	<u>.</u>				
Social Con	npetences							
K01	Written test. Pro	esentation, discussi	on. Evaluation a pro	ject				
K02	Written test. Pro	esentation, discussi	on.	·				
Evaluatio	n methods	Evaluation of the t	est and project.					
Exam		No						
Reference	es	1. CATIA V5R20 for Designers Paperback – 1 January 2010 by Prof. Sham Purdue Tickoo Univ.						
Subject w	vebsite	-						
D. Studer	nt's contribution	on						
Number points	of ECTS	3						
Number of	of hours of	1) Number of cont	act hours - 30, inclu	ding:				
student's	work	a) lecture - 15 h.;	,	0				
connecter	d with	b) project – 15 h;						
achieving	learning	2) Student's own v	vork:					
outcome	, icui iiiig	a) 15 h – literature	e studies,					
outcomes		b) 15 h – preparin	g for test from lectu	res/presentations,				
		c) 15 h – preparin	g project,					
		3) TOTAL – 75 h						
Number o	mber of ECTS points 1 ECTS point - number of contact hours - 30, including:							

for classes requiring	a) lecture - 15 h;
direct participation of	b) project – 15 h;
members of academic	
staff:	
Number of ECTS points	2 ECTS point - 45 h, including:
obtained by a student	1) 15 h – preparing a project of a controlled suspension system,
within practical	2) 15 h – preparing for a test/presentation
	3) 15 h – preparing project,
E. Additional informati	on
Comments	-
Update date	3.10.2022 r.
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Descriptio	n of a subject					
Subject co	ode					
Subject		KNOWLEGDE BASED SYSTEMS IN ENGINEERING	DESIGN			
Subject v	ersion	2022/23				
A. Placing	the subject wit	hin the study system				
Level of s	tudy	II degree				
Form of s	tudy	Full-time study				
Field of st	tudy	Mechanical Engineering				
Profile of	study	General academic				
Degree pi	rogram	Advanced Machinery and Vehicles Engineering				
Supervisi	ng unit	Faculty of Automotive and Construction Machinery Engine	eering			
Performi	ng unit	Faculty of Automotive and Construction Machinery Engine	eering			
Subject co	oordinator					
B. Genera	al characterist	ics of the subject				
Subject k	ind	Specialised				
Subject le	evel	Advanced				
Subject g	roup	Elective A				
Language	e of	English				
instructio	n					
Nominal	semester	4				
Course d	elivery in the	Summer				
Pre-requi	sites	Design Theory				
Limit of	number of	30				
students	number of					
C. Learni	ng outcomes a	nd the manner of conducting classes				
Aim of th	e subject	Obtaining basic knowledge on expert systems applications application based Engineering and Knowledge Management methods	on in engineering de and tools.	esign, Knowledge		
Subject ou	tcomes					
Code	Description of the outcomes		<i>Reference to learning outcomes in the learning area</i>	Learning outcomes for field of study		
Knowledg	e					
W01	Has knowledge in the field of the engineering knowledge modeling.		I.P7S_WG.o	K_W01		
W02	Has detailed knowledge of the engineering knowledge modeling.		I.P7S_WG.o	K_W11		
W03	N03 Has knowledge within the scope of methods and tools in engineering knowledge modeling.			K_W01		
Skills						
U01	Is prepared to chosen sources obtained inform	obtain information from literature and other properly s within the scope of the subject; can integrate the nation, interpret it and draw conclusions and formulate	I.P7S_UW.o	K_U15		

	and justify opir knowledge mod	nions within the sc lelling.				
U02	Knows how to a application of e	vs how to make a written and oral presentation within the scope of cation of engineering knowledge modeling, structuring and sharing.				
U03	Knows how to c	btain knowledge o	n their own, within	the scope of issues		
	related to app establish directi	related to application of engineering knowledge modeling and can I.P7S_UW.o K_U15 establish directions for self-study.				
Social Con	npetences					
K01	Understands the influence of application of engineering knowledge modeling and knows how to convey this information to society.				I.P7S_KO I.P7S_KR	K_K01
K02	Can think and a	ct in an entrepreneı	urial manner.			
Form of	f classes and	Lecture	Evercises	Laboratory	Project	Computer classes
their dur	ation	Lecture	LACICISES	Laboratory	Tioject	computer classes
Timetable	S	2	0	0	0	0
Througho	ut the semester	30	0	0	0	0
		 Knowledge representations in expert systems. Knowledge Based Engineering- methods and tools. Knowledge Based Engineering - examples of application. Knowledge Management Systems. Knowledge Management Systems - examples of application. Repositories of engineering design knowledge. Functional modeling of product. Case Based Reasoning in engineering design. Blackboard architecture in mechanical engineering. Intelligent Personal Assistant systems in engineering design. 				
Learning	methods	lecture presentation	on , i			
Learning methods lecture presentation						
Methods a	of examination o	f learnina outcome	es			
Methods of Code	of examination of Evaluation met	f learning outcome thods	es			
Methods o Code Knowleda	of examination o Evaluation met ne	f learning outcome thods	25			
Methods of Code Knowledg W01	of examination o Evaluation met ge Written test, Pro	f learning outcome thods esentation, discussion	on			
Methods of Code Knowledg W01 W02	of examination of Evaluation met ge Written test. Pro Written test.	f learning outcome thods esentation, discussion	on			
Methods of Code Knowledg W01 W02 W03	of examination of Evaluation met ge Written test. Pro Written test. Written test	f learning outcome thods esentation, discussio	on			
Methods of Code Knowledg W01 W02 W03 Skills	of examination of Evaluation met ge Written test. Pro Written test. Written test.	f learning outcome thods esentation, discussio	on			
Methods of Code Knowledg W01 W02 W03 Skills	by examination of Evaluation met ge Written test. Pro Written test. Written test.	f learning outcome thods esentation, discussion	on			
Methods of Code Knowledg W01 W02 W03 Skills U01 U02	bf examination of Evaluation met ge Written test. Pro Written test. Written test. Written test.	f learning outcome thods esentation, discussio	on			
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03	bf examination of Evaluation met ge Written test. Pro Written test. Written test. Written test. Written test.	f learning outcome thods esentation, discussio	on			
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Cor	bf examination of Evaluation met ge Written test. Pro Written test. Written test. Written test. Written test. Written test.	f learning outcome thods esentation, discussio	on			
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con	bf examination of Evaluation met ge Written test. Provide the test Written test. Written test. Written test. Written test. Written test. mpetences	f learning outcome thods esentation, discussio	on			
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01	bf examination of Evaluation met ge Written test. Pro Written test. Written test. Written test. Written test. Written test. mpetences Written test. Discussing	f learning outcome thods esentation, discussio	on			
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 W03 Skills U01 K01 K02	by examination of Evaluation met Written test. Provide the Written test. Written test. Written test. Written test. Written test. mpetences Written test. Discussing	f learning outcome thods esentation, discussion	es on			
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02	of examination of Evaluation met Written test. Provide the state Written test. Written test. Written test. Written test. Written test. Discussing	flearning outcome thods esentation, discussion written test Prese	on on			
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio	of examination of Evaluation met ge Written test. Provide the second Written test. Written test. Written test. Written test. Mritten test. Discussing	f learning outcome thods esentation, discussion Written test. Prese	es on 			
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio Exam Roforence	of examination of Evaluation met Written test. Provide the second Written test. Written test. Written test. Written test. Written test. Written test. Discussing	f learning outcome thods esentation, discussion Written test. Prese No Materials in Englis	entation, discussion	hased on different k	nowledge sources)	
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio Exam Reference	of examination of Evaluation met Written test. Provide the second Written test. Written test. Written test. Written test. Written test. Discussing Mathematical Second Mathematical Second	f learning outcome thods esentation, discussion written test. Prese No Materials in Englis	es on entation, discussion h (for each lecture,	based on different k	nowledge sources)	
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio Exam Reference Subject w	of examination of Evaluation met Written test. Provide the second Written test. Written test. Written test. Written test. Written test. Discussing methods es	flearning outcome thods esentation, discussion written test. Prese No Materials in Englis	entation, discussion ch (for each lecture,	based on different k	nowledge sources)	
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio Exam Reference Subject w D. Studen	of examination of Evaluation met ge Written test. Provide the set of the set	flearning outcome thods esentation, discussion written test. Prese No Materials in Englis - on	ess on entation, discussion ch (for each lecture,	based on different k	nowledge sources)	
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio Exam Reference Subject w D. Studer Number points	of examination of Evaluation met Written test. Provide the set of	flearning outcome thods esentation, discussion written test. Prese No Materials in Englis - on 2	ess on entation, discussion ch (for each lecture,	based on different k	nowledge sources)	
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio Exam Reference Subject w D. Studen Number points Number of	of examination of Evaluation met Written test. Prove Written test. Written test. Written test. Written test. Written test. Written test. Discussing methods es vebsite of ECTS of hours of	f learning outcome thods esentation, discussion written test. Prese No Materials in Englis - on 2 1) Number of cont	es on entation, discussion th (for each lecture, act hours - 30, inclu	based on different k ding:	nowledge sources)	
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio Exam Reference Subject w D. Studer Number points Number of student's	of examination of Evaluation met Written test. Pro Written test. Written test. Written test. Written test. Written test. Written test. Discussing methods es vebsite nt's contribution of ECTS of hours of work	flearning outcome thods esentation, discussion written test. Prese No Materials in Englis - on 2 1) Number of cont a) lecture - 30 h.;	es on entation, discussion ch (for each lecture, act hours - 30, inclu	based on different k ding:	nowledge sources)	
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio Exam Reference Subject w D. Studer Number points Number of student's connecter	of examination of Evaluation met ge Written test. Provide the set of the set	flearning outcome thods esentation, discussion written test. Prese No Materials in Englis - On 2 1) Number of cont a) lecture - 30 h.; 2) Student's own v	es on entation, discussion ch (for each lecture, act hours - 30, inclu vork:	based on different k ding:	nowledge sources)	
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio Exam Reference Subject w D. Studen Subject w D. Studen Student's connected achieving	of examination of Evaluation met ge Written test. Provide the set of the set	<i>f learning outcome</i> thods esentation, discussion esentation, discussion written test. Prese No Materials in Englis - on 2 1) Number of cont a) lecture - 30 h.; 2) Student's own v a) 15 h – literature	es on entation, discussion th (for each lecture, act hours - 30, inclu vork: e studies,	based on different k	nowledge sources)	
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio Exam Reference Subject w D. Studen Number points Number of student's connected achieving outcomes	of examination of Evaluation met Written test. Provide the set of	<i>f learning outcome</i> thods esentation, discussion esentation, discussion written test. Prese No Materials in Englis - on 2 1) Number of cont a) lecture - 30 h.; 2) Student's own v a) 15 h – literature b) 15 h – preparin b) T5 h – preparin	es on entation, discussion th (for each lecture, act hours - 30, inclu vork: e studies, ng for tests from lect	based on different k ding: ures/presentations,	nowledge sources)	
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio Exam Reference Subject w D. Studen Number points Number of student's connecte achieving outcomes	of examination of Evaluation met Written test. Provide the set of	<i>f learning outcome</i> thods esentation, discussion esentation, discussion written test. Prese No Materials in Englis - Dn 2 1) Number of cont a) lecture - 30 h.; 2) Student's own v a) 15 h - literature b) 15 h - preparin 3) TOTAL - 60 h	entation, discussion entation, discussion th (for each lecture, act hours - 30, inclu vork: e studies, ig for tests from lect	based on different k ding: ures/presentations,	nowledge sources)	
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio Exam Reference Subject w D. Studen Number points Number of student's connecte achieving outcomes	of examination of Evaluation met Written test. Pro- Written test. Written test. Written test. Written test. Written test. Written test. Discussing methods es vebsite nt's contribution of ECTS of hours of work d with g learning s: of ECTS points	<i>f learning outcome</i> thods esentation, discussion esentation, discussion written test. Prese No Materials in Englis - On 2 1) Number of cont a) lecture - 30 h.; 2) Student's own v a) 15 h – literature b) 15 h – preparin 3) TOTAL – 60 h 1 ECTS point – nur a) lecture - 30 h:	ess on entation, discussion th (for each lecture, act hours - 30, inclu vork: e studies, lg for tests from lect nber of contact hour	based on different k ding: ures/presentations, rs - 30, including:	nowledge sources)	
Methods of Code Knowledg W01 W02 W03 Skills U01 U02 U03 Social Con K01 K02 Evaluatio Exam Reference Subject w D. Studen Number points Number of student's connected achieving outcomes	of examination of Evaluation met ye Written test. Provide the set of the s	flearning outcome thods esentation, discussion written test. Prese No Materials in Englis - On 2 1) Number of cont a) lecture - 30 h.; 2) Student's own v a) 15 h – literaturo b) 15 h – preparin 3) TOTAL – 60 h 1 ECTS point – nur a) lecture - 30 h;	ess on entation, discussion th (for each lecture, act hours - 30, inclu vork: e studies, ng for tests from lect mber of contact hour	based on different k ding: ures/presentations, rs - 30, including:	nowledge sources)	

staff:					
Number of ECTS points	1 ECTS point - 30 h, including:				
obtained by a student	1) 15 h – preparing a project of a specific method application,				
within practical	2) 15 h – preparing for tests				
E. Additional information					
Comments	-				
Update date	3.10.2022 r.				

Descriptio	n of a subject						
Subject c	ode						
Subject		MODELING OF MACHINE ELEMENTS BY USING ORIGINAL PROGRAMS IN FEM					
Subject v	ersion	2022/23					
A. Placing	, the subject wit	hin the study system					
Level of s	study II degree						
Form of s	tudy	Full-time study					
Field of s	tudy	Mechanical Engineering					
Profile of	study	General academic					
Degree p	rogram	Advanced Machinery and Vehicles Engineering					
Supervisi	ng unit	Faculty of Automotive and Construction Machinery Engine	eering				
Performi	ng unit	Faculty of Automotive and Construction Machinery Engine	eering				
Subject c	oordinator						
B. Genera	al characterist	ics of the subject					
Subject k	ind	Specialised					
Subject le	evel	Advanced					
Subject g	roup	Elective B					
Language	e of	English					
instructio	on						
Nominal	semester	4					
Course d	elivery in the	Summer					
academic	year						
Pre-requisites Finite Element Methods, Mechanics, Theory of Vibrations							
Limit of	number of	30					
students							
C. Learni	ng outcomes a	nd the manner of conducting classes					
Aim of the subject		Learning how to built original computer programs for stress and flexibility calulation of machine elements by using finite element method. Help to develop small Matlab mechanical models for use in mechanical and servo-mechanical systems. Learning to obtain information from literature and other properly chosen sources within the scope of the subject; can integrate the obtained information, interpret it and draw conclusions, formulate and justify opinions within the scope of the application of finite element technique in machine design.					
Subject ou	tcomes						
Code	Description of	the outcomes	Reference to learning outcomes in the learning area	Learning outcomes for field of study			
Knowledge							
W01	Has well-ordered and theoretically-based knowledge in the field of materials mechanics, indispensable to perform strength analysis of construction elements, including the use of computer systems.			K_W01			
W02	Has in-depth k and vehicle des	nowledge in the field of computer modeling of machine ign issues.	I.P7S_WG.o	K_W11			
W03	Knows and understands basic methods applied in modeling of technical systems. I.P7S_WG.o K_W01						
Skills							
U01	Knows how to use learnt mathematical and physical methods and models to support implementation of engineering processes, by means of I.P7S_UW.o						

	assessments and critical analysis.						
110.2	Knows how to avagagefully perform modelling and suptractiving process						
002	Knows how to successfully perform modelling and synthesizing process of advanced mechanical systems, and to critically assess the obtained solutions.				I.P7S_UW.o	K_U15	
U03	Can practically implement knowledge in the field of computer, advanced modelling in order to analyze and technically simulate issues of machine and vehicle construction.				I.P7S_UW.o	K_U15	
Social Con	npetences						
К01	Understands the need to critically analyze of a content and appreciation of knowledge while solving engineering problems within the field of machine and vehicle construction, and the importance of a proper attitude while formulating and conveying to a society in a commonly understandable manner information and opinions relating to achievements in the field of machine and vehicle construction, as well as other aspects of a mechanical engineer's activity responsibility and a proper attitude towards observing ethics and safety procedures related to a particular job.					К_К01	
Form of	classes and	Lastura	Eveneiree	Labouttown	Ducient	Commuter alagaa	
their dura	ation	Lecture	Exercises	Laboratory	Project	computer classes	
Timetable	s	1	0	0	1	0	
Througho	ut the semester	15	0	0	15	0	
Learning content		 Deriving matrix equations of motion. Formulate computer programs in Matlab code. Finite element analysis used in description of rigid mechanism motion. Comparison with classical methods of theory of mechanisms. Finite element modeling of shaft joints, clamped masses, continuous loading. Writing a computer program for transient elements by using Timoshenko beam and CST elements - example of main connection rod of a star engine. Stress and strain calculations of Belleville disc springs. France of vibration analysis of beams – discussion on structural damping. 					
Learning	methods	lecture presentation Project: preparing a short computer program for calculations of machine elements based on FEM.					
Methods o	of examination o	f learning outcom	es				
Code	Evaluation met	thods					
Knowledg	ie						
W01	Written test. Pr	eparing a computer	program				
W02	Written test. Pr	eparing a computer	program				
W03	Written test. Pr	eparing a computer	program				
Skills							
U01	Written test. Pr	eparing a computer	program				
U02	Written test. Pr	Nritten test. Preparing a computer program					
U03	Written test. Pr	eparing a computer	program				
Social Competences							
K01 Written test. Preparing a computer program							
K02 Written test. Preparing a computer program							
Evaluation wathoda Whitten test Duenering a semanter magnem							
Evaluation methods		No					
Exam		1 Bathe KI. Finite element procedures in angineering analysis. Proptice Hall New Jersey 1992					
Keterences		 Bathe K.J., Finite element procedures in engineering analysis, Prentice Hall, New Jersey 1982. Hatch M.R., Vibration simulation using Matlab and Ansys, Chapman&Hall/Crc, Boca Raton 2001. 					
Subject website -							
D. Studer	nt's contributi	on					
Number	of ECTS	3					
points	()		. 1	1 1.			
Number of	of hours of	1) Number of cont	act hours – 40 h, inc	luding:			
student's	WORK	a) practicals – 30 f	ı.; 10				
connected with		2) Student's own work – 35 h, including:					

achieving learning	a) literature study – 10 h;			
outcomes:	b) student's preparation for tutorials – 10 h;			
	c) preparation a project15 h;			
	3) TOTAL – 75 h			
Number of ECTS points	1.5 ECTS points – number of contact hours – 40 hours, including:			
for classes requiring	a) practicals – 30 hours;			
direct participation of	b) consultations – 10 hour			
members of academic				
staff:				
Number of ECTS points	1.5 ECTS points – 35 h, including:			
obtained by a student	a) student's preparation for tutorials – 10 h			
within practical	b) preparation a project 15 h;			
				
E. Additional information				
Comments	-			
Update date	3.10.2022 r.			

Social Competences							
K01	Understands the influence of application in web databases systems and				I.P7S_KO	17 1701	
	knows how to convey this information to society.				I.P7S_KR	K_KU1	
K02	Can think and act in an entrepreneurial manner.				I.P7S_KO	к ко1	
					I.P7S_KR		
				1	1	1	
Form of	classes and	Lecture	Exercises	Laboratory	Project	Computer classes	
their dura	ation						
Timetable	S	1	0	0	1	0	
Throughou	it the semester	15	0	0	15	0	
-		1.0.1.0.1					
Learning	content	1. Overview of the	databases system	IS			
		2. PHPMyAdmin	co structuros				
		4 Operations in d	atahase				
		5. Creating views	in database				
		6. Triggers in data	ibase				
Learning	methods	lecture presentation					
		project: preparing	a computer progra	am (web database).			
Methods o	f examination o	f learning outcome	2S				
Code	Evaluation met	thods					
Knowledg	е						
W01	Written test. Preparing a computer program						
W02	Written test. Preparing a computer program						
W03	Written test. Pr	eparing a computer	program				
Skills							
U01	Written test. Pr	eparing a computer	program				
U02	Written test. Preparing a computer program						
U03	Written test. Preparing a computer program						
Social Competences							
K01	Written test. Preparing a computer program						
K02	Written test. Preparing a computer program						
Evaluation	n methods	Written test. Preparing a computer program					
Exam		No					
References		Materials in English will be shared electronically.					
Subject website		-					
D. Student's contribution							
Number	of ECTS	3					
points							
Number o	of hours of	1) Number of cont	act hours – 40 h, ir	ncluding:			
student's	work	a) practicals – 30 h.;					
connected with		b) consultations – 10					
achieving learning	2) Student's own work – 35 h, including:						
---------------------------	--	--	--	--			
outcomes:	a) literature study – 10 h;						
	b) student's preparation for tutorials – 10 h;						
	c) preparation a project15 h;						
	3) TOTAL – 75 h						
Number of ECTS points	1.5 ECTS points – number of contact hours – 40 hours, including:						
for classes requiring	a) practicals – 30 hours;						
direct participation of	b) consultations – 10 hour						
members of academic							
staff:							
Number of ECTS points	1.5 ECTS points – 35 h, including:						
obtained by a student	a) student's preparation for tutorials – 10 h						
within practical	b) preparation a project 15 h;						
F							
E. Additional information							
Comments	-						
Update date	3.10.2022 r.						

Descriptio	n of a subject						
Subject co	ode						
Subject		ART OF PRESENTATION					
Subject v	ersion	2022/23					
A. Placing	the subject wit	hin the study system					
Level of s	tudy	II degree					
Form of s	tudy	Full-time study					
Field of st	cudy	Mechanical Engineering					
Profile of	study	General academic					
Degree p	rogram	Advanced Machinery and Vehicles Engineering					
Supervisi	ng unit	Faculty of Automotive and Construction Machinery Engin	eering				
Performi	ng unit	Faculty of Automotive and Construction Machinery Engin	eering				
Subject co	oordinator						
B. Genera	al characterist	ics of the subject					
Subject k	ind	Basic	Basic				
Subject le	vel	Basic					
Subject g	roup	Elective HES 1	Elective HES 1				
Language	of	English					
instructio	n						
Nominal	semester	1					
Course d	se delivery in the Winter						
academic y	/ear						
Pre-requi	sites	Basic engineering knowledge					
Limit of	number of	30					
students	-						
C. Learni	ng outcomes a	ind the manner of conducting classes		1 .1 .1			
Aim of the subject The course aims to familiarize students with the art of presentation, the body language, the a of public speaking. Learning to obtain information from literature and other properly chosen sources within the scope of the subject; can integrate the obtained information, interpret it and draw conclusion formulate and justify opinions within the scope of the art of presentation.				v language, the art ources within the draw conclusions,			
Subject ou	tcomes						
Code	e Description of the outcomes Earning outcomes in the learning area						
Knowledg	е						
W01	Has basic knowledge in the field of the art of presentation.						

W02	Has detailed knowledge of the art of presentation.				I.P7S_WG.o	K_W11
W03	Has knowledge within the scope of the art of presentation.				I.P7S_WG.o	K_W01
Skills						
U01	Is prepared to obtain information from literature and other properly chosen sources within the scope of the subject; can integrate the obtained information, interpret it and draw conclusions and formulate and justify opinions within the scope of the art of presentation				I.P7S_UW.o	K_U15
U02	Knows how to the art of prese	make a written and ntation.	oral presentation	within the scope of	I.P7S_UW.o	K_U15
U03	Knows how to c related to the ar	btain knowledge or rt of presentation.	1 their own, within 1	the scope of issues	I.P7S_UW.o	K_U15
Social Con	npetences					
K01	Understands the understandable in the art of pre	e need to formulate way the informatio sentation.	and communicate i on and opinions on t	n a commonly he achievements	I.P7S_KO I.P7S_KR	К_К01
K02	Can think and a	ct in an entrepreneu	urial manner.		I.P7S_KO I.P7S_KR	K_K01
			1			
Form of their dura	classes and ation	Lecture	Exercises	Laboratory	Project	Computer classes
Timetable	S	2	0	0	0	0
Throughou	ut the semester	30	0	0	0	0
Learning Methods o Code Knowledg W01 W01 W01 Skills U01 U02 U02	2. Art of public speaking.3. Assertiveness.4. Decision-making.5. Time management.6. Shyness.7. Techniques of exerting impact, how to effectively achieve goals.8. Body language.9. Test. Student presentations.Learning wethodslecture presentation Presentation a project of the art of presentation.Methods veramination of learning outcomesCodeEvaluation methodsWollWoritten test. Presentation, discussionWollWritten test. Presentation, discussion. Evaluation a project					
U03	Written test. Pr	esentation. discussion	on.	,		
Social Con	npetences					
K01	Written test. Pr	esentation, discussi	on. Evaluation a pro	oject		
K02	Presentation, di	scussion. Evaluation	n a project			
	·					
Evaluation	n methods	Written test. Prese	ntation, discussion.	Evaluation a projec	t	
Exam		No				
References 1.J. Stovall, R. H. Hull, The Art of Presentation: Your Competitive Edge, Publisher: Sou Wisdom, 2017. 2.R. Hall, Brilliant Presentation 3e: What the best presenters know, do and say, Publish Pearson Education Limited, 2012. 3.J. van Emden, L. Becker, Presentation Skills for Students, Publisher: Macmillan Education 2016. 4.G. Reynolds, Presentation Zen: Simple Ideas on Presentation Design and Delivery, Publish Pearson Education US, 2011. 5.N. Duarte. The Art and Science of Creating Great Presentations. Publisher: O'Reilly Me				Publisher: Sound nd say, Publisher: llan Education UK, Delivery, Publisher: er: O'Reilly Media,		

	2008.				
Subject website	-				
D. Student's contributi	on				
Number of ECTS	2				
points					
Number of hours of	1) Number of contact hours - 30, including:				
student's work	a) lecture - 30 h;				
connected with	2) Student's own work:				
achieving learning	a) 15 h - literature studies;				
outcomes:	DJ 15 N – preparing for test from lectures/presentations;				
Number of FCTS points 1 ECTS point – number of contact hours - 30, including:					
for classes requiring	a) lecture - 30 h;				
direct participation of					
members of academic					
staff:					
Number of ECTS points	1 ECTS point - 30 h, including:				
obtained by a student	1) 15 h – preparing a project of the art of presentation ;				
within practical 2) 15 h – preparing for a test/presentation;					
E. Additional information					
Comments	-				
Update date	3.10.2022 r.				

Description of a subject				
Subject code				
Subject	BUSINESS ETHICS			
Subject version	2022/23			
A. Placing the subject wit	hin the study system			
Level of study	II degree			
Form of study	Full-time study			
Field of study	Mechanical Engineering			
Profile of study	General academic			
Degree program	Advanced Machinery and Vehicles Engineering			
Supervising unit	Faculty of Automotive and Construction Machinery Engine	ering		
Performing unit	Faculty of Automotive and Construction Machinery Engine	eering		
Subject coordinator				
B. General characterist	tics of the subject			
Subject kind	Basic			
Subject level	Basic			
Subject group	Elective HES 1			
Language of instruction	English			
Nominal semester	1			
Course delivery in the academic year	Winter			
Pre-requisites	Basic engineering knowledge			
Limit of number of	30			
students				
C. Learning outcomes and the manner of conducting classes				
Aim of the subject	The course aims to familiarize students with business eth	ics and its issues, et	nical standards of	
	a good manager, ethical dilemmas, conflict of values, decision-making, processes in business			
	and management. Learning to obtain information from literature and other properly chosen			
	sources within the scope of the subject; can integrate the	obtained information	ii, interpret it and	
Subject outcomes		le scope of business e	eunes.	
Code Description of a	the outcomes	Reference to	Learnina	

					learning outcomes in the learning area	outcomes for field of study
Knowledg	e				9	
W01	Has basic know	ledge in the field of	business ethics.		I.P7S_WG.o	K_W01
W02	Has detailed kn	owledge of business	ethics.		I.P7S_WG.o	K_W11
W03	Has knowledge	within the scope of	business ethics.		I.P7S_WG.o	K_W01
Skills						
U01	Is prepared to chosen sources obtained inform and justify opin	obtain information s within the scope nation, interpret it ions within the scop	n from literature a e of the subject; and draw conclusi pe of business ethics	nd other properly can integrate the ons and formulate	I.P7S_UW.o	K_U15
U02	Knows how to business ethics.	make a written and	oral presentation v	within the scope of	I.P7S_UW.o	K_U15
U03	Knows how to related to bu	obtain knowledge of siness ethics and ca	n their own, within n establish direction	the scope of issues 1s for self-study.	I.P7S_UW.o	K_U15
Social Con	npetences					
K01	Understands th understandable in business eth	e need to formulate way the informatio ics.	and communicate i n and opinions on t	n a commonly he achievements	I.P7S_KO I.P7S_KR	K_K01
K02	Can think and a	ct in an entrepreneu	ırial manner.		I.P7S_KO I.P7S_KR	K_K01
form of their dura	classes and	Lecture	Exercises	Laboratory	Project	Computer classes
Timetable	S	2	0	0	0	0
Throughout	ut the semester	30	0	0	0	0
Learning content 1. Organizational matters. Introduction to issues connected 2. Purpose and scope of ethics. 3. Business ethics and its issues. 4. Ethical dilemmas, conflict of values, decision-making pro 5. Ethical standards of a good manager. 6. Corporate social responsibility – idea and implementation 7. Work ethics – rights and duties of employees. 8. Tools for shaping ethical attitudes in organizations. 9. Moral and legal aspects of the obligation to keep a secret 10. Test Student precentations.				ed with business etl rocesses in business ion. et.	nics. and management.	
Learning	methods	lecture presentation presentation : prep	on paring a project of b	usiness ethics.		
Methods of	of examination o	f learning outcome	25			
Code	Evaluation met	thods				
W01	e Written test Dr	esentation discussion	on			
W01	Written test. Pr	esentation, discussion	on			
W01	Written test. Pr	esentation, discussion	on			
Skills	1					
U01	Written test. Presentation, discussion. Evaluation a project					
U02	Written test. Presentation, discussion. Evaluation a project					
U03	Written test. Pr	esentation, discussion	on.			
Social Con	npetences			•		
K01	Written test. Pr	esentation, discussion	on. Evaluation a pro	ject		
KUZ	Presentation, di	scussion. Evaluation	n a project			
Evaluatio	n methods	Written test. Prese	ntation, discussion.	Evaluation a project	t	
Exam		No	,			
Reference	es	1.William H. Shaw, 2.Andrew W. Ghilly	Vincent Barry, Mor ver, Business Ethics	al Issues in Busines Now, Publisher: Mc	s, Cengage, 2014. Graw-Hill/ Irwin, 20)11.

	 3.Anne T. Lawrence, Business and Society: Stakeholders, Ethics, Public Policy, Publisher: McGraw-Hill Education, 2016. 4.Craig E. Johnson, Meeting the Ethical Challenges of Leadership, Publisher: SAGE Publications, 2017. 5.O. C. Ferrell, J. Fraedrich, Business Erhics: Ethical Decision Making and Cases, Publisher: South Western, 2000.
	6. http://www.bg.pw.edu.pl/index.php/en/resources/database-list,
Subject website	-
D. Student's contribution	DN
Number of ECTS	2
points	
Number of hours of student's work connected with achieving learning outcomes: Number of ECTS points for classes requiring direct participation of members of academic	 1) Number of contact hours - 30, including: a) lecture - 30 h; 2) Student's own work: a) 15 h - literature studies; b) 15 h - preparing for test from lectures/presentations; 3) TOTAL - 60 h 1 ECTS point - number of contact hours - 30, including: a) lecture - 30 h.;
Number of ECTS points obtained by a student within practical	 1 ECTS point - 30 h, including: 1) 15 h - preparing a project of business ethics; 2) 15 h - preparing for a test/presentation;
E. Additional informati	on
Comments	-
Update date	3.10.2022 r.

Description of a subject				
Subject code				
Subject	PATENT LAW			
Subject version	2022/23			
A. Placing the subject wit	hin the study system			
Level of study	II degree			
Form of study	Full-time study			
Field of study	Mechanical Engineering			
Profile of study	General academic			
Degree program	Advanced Machinery and Vehicles Engineering			
Supervising unit	aculty of Automotive and Construction Machinery Engineering			
Performing unit	aculty of Automotive and Construction Machinery Engineering			
Subject coordinator				
B. General characterist	tics of the subject			
Subject kind	Basic			
Subject level	Basic			
Subject group	Elective HES 2			
Language of	English			
instruction				
Nominal semester	4			
Course delivery in the	Summer			
academic year				
Pre-requisites	-			
Limit of number of	30			
students				
C. Learning outcomes a	and the manner of conducting classes			

Aim of the subject The course aims to familiarize students with patent lindustrial property objects. Learning to obtain information from literature and of scope of the subject; can integrate the obtained inform formulate and justify opinions within the scope of pain business.			ents with patent law, n literature and othe he obtained informat n the scope of patent	patent office and tr r properly chosen s ion, interpret it and law. Learning abou	ransfer of rights to sources within the draw conclusions, t intellectual value	
Subject ou	tcomes	·				
Code	Description of the outcomes				Reference to learning outcomes in the learning area	Learning outcomes for field of study
Knowledg	е					
W01	Has basic know	ledge in the field of	patent law.		I.P7S_WG.o	K_W01
W02	Has detailed kn	owledge of patent la	aw and impact on [business.	I.P7S_WG.o	K_W11 K_W19
W03	Has knowledge	within the scope of	patent law		I.P7S_WG.o	K_W01
Skills	·					
U01	Is prepared to chosen sources obtained inform and justify opin	obtain information s within the scop nation, interpret it ions within the scop	n from literature e of the subject; and draw conclus be of patent law	and other properly can integrate the sions and formulate	I.P7S_UW.o	K_U15
U02	Knows how to patent law	make a written and	l oral presentation	within the scope of	I.P7S_UW.o	K_U15
U03	Knows how to or related to pater	obtain knowledge o It law and can estab	n their own, within lish directions for	n the scope of issues self-study.	I.P7S_UW.o	K_U15
Social Con	npetences					
K01	Understands the need to formulate and communicate in a commonly understandable way the information and opinions on the achievements in patent law K_K01					K_K01
K02	Can think and a	ct in an entreprene	urial manner.		I.P7S_KO I.P7S_KR	K_K01
Earma of	alagaaa amd					
their dura	ation	Lecture	Exercises	Laboratory	Project	Computer classes
Timetable	S	2	0	0	0	0
Throughou	ut the semester	30	0	0	0	0
Learning content 1. Organizational matters. Introduction to issues connected with patent law. 2. Patent office and patent attorneys. 3. Inventive projects and subjects of rights to these projects. 4. Types and content of rights to industrial property objects. 5. Proceedings before the Patent Office. 6. Transfer of rights and licensing of industrial property objects. 7. General rules for combating unfair competition. 8. Test. Student presentations.						
Learning	methods	lecture presentatio	on			
Methods of	f examination o	f learning outcom	es			
Code	Evaluation me	thods				
Knowleag	e Writton tost Dr	acontation discussi	02			
W01 W02	Written test. Presentation, discussion					
W02	Written test Pr	esentation discussi	on			
Skills		esentation, discussi	~			
U01	Written test Pr	esentation, discussi	on. Evaluation a p	roiect		
U02	Written test Pr	esentation discussi	on. Evaluation a p	roiect		
U03	Written test. Pr	esentation, discussi	on.	,		
Social Con	npetences					
K01	Written test. Pr	esentation. discussi	on. Evaluation a p	roject		
K02	Presentation. d	scussion. Evaluatio	n a proiect	,		

Evaluation methods	M.Sc. thesis			
Exam	No			
References	 Janice M. Mueller, An Introduction to Patent Law, Publisher: Aspen Publishers Inc., U.S., 2003. Janice M. Mueller, Patent Law, Publisher: Aspen Publishers Inc., U.S., 2012. Herbert F. Schwartz, Patent Law and Practice, Publisher: Bna Books, Subsequent edition, 2003. Amy L. Landers, Understanding Patent Law, Publisher: LexisNexis, second edition, 2012. Craig Allen Nard, The Law of Patents, Publisher: Aspen Publishers, 2008. 			
Subject website	-			
D. Student's contribution	on			
Number of ECTS points	3			
Number of hours of student's work connected with achieving learning outcomes:	 Number of contact hours - 40 h, including: a) practicals - 30 h.; b) consultations - 10 2) Student's own work - 35 h, including: a) literature study - 10 h; b) student's preparation for tutorials - 10 h; c) preparation a project15 h; 3) TOTAL - 75 h 			
Number of ECTS points for classes requiring direct participation of members of academic staff:	 1.5 ECTS points - number of contact hours - 40 hours, including: a) practicals - 30 hours; b) consultations - 10 hour 			
Number of ECTS points obtained by a student within practical	 1.5 ECTS points – 35 h, including: a) student's preparation for tutorials – 10 h b) preparation a project 15 h; 			
E. Additional informati	on			
Comments	-			
Update date	3.10.2022 r.			

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Description of a subject				
Subject code				
Subject	STRUCTURAL FUNDS			
Subject version	2022/23			
A. Placing the subject wit	hin the study system			
Level of study	II degree			
Form of study	Full-time study			
Field of study	Mechanical Engineering			
Profile of study	General academic			
Degree program	dvanced Machinery and Vehicles Engineering			
Supervising unit	Faculty of Automotive and Construction Machinery Engineering			
Performing unit	Faculty of Automotive and Construction Machinery Engineering			
Subject coordinator				
B. General characterist	ics of the subject			
Subject kind	Basic			
Subject level	Basic			
Subject group	Elective HES 2			
Language of	English			
instruction				
Nominal semester	4			
Course delivery in the	Summer			

academic y	year					
Pre-requi	quisites -					
Limit of students	number of 30					
C. Learni	ng outcomes a	nd the manner o	f conducting cla	sses		
Aim of the	e subject	The course aims t	to familiarize stude	ents with the struc	tural funds operati	ional programs in
Aim of the subject The course aims to familiarize students with the structural funds, operational progr Poland, cohesion policy objectives. Learning to obtain information from literature and other properly chosen sources wit scope of the subject; can integrate the obtained information, interpret it and draw concl formulate and justify opinions within the scope of structural funds.				sources within the draw conclusions,		
Subject ou	tcomes			•		
Code	de Description of the outcomes				Reference to learning outcomes in the learning area	Learning outcomes for field of study
Knowledg	е					
W01	Has basic know	ledge in the field of	structural funds.		I.P7S_WG.o	K_W01
W02	Has detailed kn	owledge of structura	al funds.		I.P7S_WG.o	K_W11 K_W19
W03	Has knowledge	within the scope of	structural funds.		I.P7S_WG.o	K_W01
Skills						
U01	Is prepared to chosen sources obtained inform and justify opin	obtain information within the scope nation, interpret it ions within the scop	n from literature a e of the subject; and draw conclusi be of structural fund	nd other properly can integrate the ons and formulate s.	I.P7S_UW.o	K_U15
U02	Knows how to a structural funds	we how to make a written and oral presentation within the scope of I.P7S_UW.o K_U15				
U03	Knows how to c related to struct	btain knowledge or cural funds and can	n their own, within establish directions	the scope of issues for self-study.	I.P7S_UW.o	K_U15
Social Con	npetences					
K01	Understands the need to formulate and communicate in a commonly understandable way the information and opinions on the achievements in structural funds.					K_K01
K02	Can think and a	ct in an entrepreneu	ırial manner.		I.P7S_KO I.P7S_KR	K_K01
Form of their dura	classes and ation	Lecture	Exercises	Laboratory	Project	Computer classes
Timetable	S	2	0	0	0	0
Throughou	ut the semester	30	0	0	0	0
Learning content 1. Organizational matters. Introduction to issues connected with structural funds. 2. Legal basis and genesis of cohesion policy. 3. Cohesion policy objectives. 4. Instruments for the implementation of cohesion policy. 5. Financing for individual purposes. 6. Operational programs in Poland. 7. Criteria for selecting projects for co-finansing. 8. Test. Student presentations. 8. Test. Student presentations.				nds.		
Learning	ning methods lecture presentation					
Methods o	f examination o	f learning outcome	25			
Code	Evaluation met	hods				
Knowledg	е					
W01	Written test. Pro	esentation, discussion	on			
W02	Written test. Pre	esentation, discussion	on			
W03	Written test. Pro	esentation, discussion	on			
Skills						
U01	Written test. Pro	esentation, discussion	on. Evaluation a pro	ject		
U02	Written test. Presentation, discussion. Evaluation a project					

Social Competences K01 Written test. Presentation, discussion. Evaluation a project K02 Presentation, discussion. Evaluation a project Evaluation methods Written test. Presentation, discussion Exam No References I.N. Christodoulakis, S. Kalyvitis, Structural Funds: Growth, Employment and the Environment, Publisher: Springer US, 2001. 3. Evans, The ELU. Structural Funds, and Capacity Building for Managing Authorities, Publisher: Palgrave Macmillan UK, 2016. 3. A. Evans, The ELU. Structural Funds, Stord University Press, 1999. 4. J. Kostka, Financing Roma Inclusion with European Structural Funds, Publisher: Neija Press&IT, 2011. Subject website - O. Student's contribution - Number of hours of student's work on the contract hours - 40 h, including: a) practicals - 30 h; b) consultations - 10 h; b) consultations - 10 h; c) preparation a project 5 h; 3) TOTAL - 75 h Number of ECTS points a literature study - 10 h; b) student's preparation for tutorials - 10 h; c) preparation a project 5 h; 3) TOTAL - 75 h Number of ECTS points a literature study - 10 h; b) student's preparation for tutorials - 10 h; c) preparation a project 15 h; 3) TOTAL - 75 h Number of ECTS points - 15 hours Number of ECTS points - 15 hours obtained by a student obtained by a student obtained by a student	U03	3 Written test. Presentation, discussion.		
K01 Written test, Presentation, discussion. Evaluation a project K02 Presentation, discussion. Evaluation a project Evaluation methods No References No References No References No Subject version Lin. Christodoulakis, S. Kalyvitis, Structural Funds: Growth, Employment and the Environment, Publisher: Springer US, 2001. 2.P. Porretta, G. Pes, Microfinance, EU Structural Funds and Capacity Building for Managing Authorities, Publisher: Palgrave Macmillan UK, 2016. 3.A. Evans, The EU. Structural Funds, Publisher: Oxford University Press, 1999. 4.J. Kostka, Financing Roma Inclusion with European Structural Funds, Publisher: Routledge, 2018. Subject vestite > D. Student's contribution Number of LOTS 3 Points 1) Number of contact hours - 40 h, including: a practicals = 30 h;: b) consultations - 10 connected with achiever study - 10 h; 3) Itorature study - 10 h; b) student's preparation a project 15 h; 3) TOTAL - 75 h Number of ECTS points 1.5 ECTS points - 30 h, including: a) practicals = 30 hours; a) practicals = 30 hours; b) consultations - 10 2) Student's own work - 35 h, including: <td< td=""><td colspan="4">Social Competences</td></td<>	Social Competences			
K02 Presentation, discussion. Evaluation a project Fealuation methods Written test. Presentation, discussion Exam No References I.N. Christodoulakis, S. Kalyvitis, Structural Funds: Growth, Employment and the Environment, Publisher: Springer US, 2001. 2.P. Porretta, G. Pes, Microfinance, EU Structural Funds and Capacity Building for Managing Authorities, Publisher: Palgrave Macmillan UK, 2016. 3.A. Evans, The EU. Structural Funds, Publisher: Growth, Employment and the Environment, Publisher: Visia, Financing Roma Inclusion with European Structural Funds, Publisher: Routledge, 2018. Subject vester > Number of ECTS Student's contribution Number of hours of student's contributions of contact hours - 40 h, including: a) practicals - 30 h.; Number of hours of student's preparation for tutorials - 10 h; 3) Student's som work - 35 h, including: a, literature study - 10 h; b) student's preparation for tutorials - 10 h; a) student's preparation for tutorials - 10 h; a) practicals - 30 hours; b) consultations - 10 hours; a) student's preparation a project 15 h; b) consultations - 10 hours; b) consultations - 10 h; c) preparation a project 15 h; b) consultations - 10 hours; a) student's preparation for tutorials - 10 h; b) consultations - 10 hours; b)	K01	Written test. Pro	n test. Presentation, discussion. Evaluation a project	
Evaluation methodsWritten test. Presentation, discussionExamNoReferences1.N. Christodoulakis, S. Kalyvitis, Structural Funds: Growth, Employment and the Environment, Publisher: Springer US, 2001. 2.P. Porretta, G. Pes, Microfinance, EU Structural Funds and Capacity Building for Managing Authorities, Publisher: Palgrave Macmillan UK, 2016. 3. A. Evans, The E.U. Structural Funds, Publisher: Oxford University Press, 1999. 4.J. Kostka, Financing Roma Inclusion with European Structural Funds, Publisher: Routledge, 2018. 5.E. Weiss, Innovativeness of industrial enterprises using European Union structural funds, Publisher: Vizja Press&IT, 2011.Subject website-D. Student's contributionNumber of ECTS pointsNumber of hours of student's work1) Number of contact hours - 40 h, including: a) practicals - 30 h; b) consultations - 10 connected with a) interature study - 10 h; b) student's preparation for tutorials - 10 h; b) student's preparation for contact hours - 40 hours, including: a) Interature study - 10 h; b) student's preparation for contact hours - 40 hours, including: a) INTAL - 75 hNumber of ECTS points direct participation of staff: Number of ECTS points - 10 hours; b) consultations - 10 hours; b) consultations - 10 hours; b) consultations - 10 hours; b) consultations - 10 hours; b) preparation a project 15 h; a) TOTAL - 75 hNumber of ECTS points direct participation of staff: Dubisher's preparation for tutorials - 10 h b) preparation a project 15 h; a) TOTAL - 75 hNumber of ECTS points direct participation a project 15 h; a) precitals - 35 h, including: a) student's preparation for tutorials - 10 h b) preparation a project 15 h;E.A	K02	Presentation, discussion. Evaluation a project		
Finduation methods Witten test. Presentation, discussion Exam No References N. Norbiotodulakis, S. Kalyvitis, Structural Funds: Growth, Employment and the Environment, Publisher: Springer US, 2001. Support Suppor				
Exam No References I.N. Christodoulakis, S. Kalyvita, Structural Funds: Growth, Employment and the Environment, Publisher: Springer US, 2001. Subject website Porretta, G. Pes, Microfinance, EU Structural Funds and Capacity Building for Managing Authorities, Publisher: Palgrave Macmillan UK, 2016. Subject website - Subject website - Number of ECTS Pointer Structural Funds, Publisher: Palgrave Macmillan UK, 2016. Number of ECTS Publisher: Vizja Press&IT, 2011. Subject website - Number of ECTS 3 Pointer Structural Funds, Publisher: Palgrave Macmillan UK, 2016. Number of Number of contact hours - 40 h, including: a) practicals - 30 h; Connected with a) practicals - 30 h; Connected with b) consultations - 10 b) student's spreparation for tutorials - 10 h; b) student's spreparation a project 15 h; c) preparation a project 15 h; c) prep	Evaluation methods		Written test. Presentation, discussion	
ReferencesI.S. Christodoulakis, S. Kalyvitis, Structural Funds: Growth, Employment and the Environment, Publisher: Springer US, 2001. 2.P. Porretta, G. Pes, Microfinance, EU Structural Funds and Capacity Building for Managing Authorities, Publisher: Palgrave Macmillan UK, 2016. 3.A. Evans, The EU. Structural Funds, Publisher: Oxford University Press, 1999. 4.J. Kostka, Financing Roma Inclusion with European Structural Funds, Publisher: Routledge, 2018. 5.E. Weiss, Innovativeness of industrial enterprises using European Union structural funds, Publisher: Vizja Press&IT, 2011.Subject website>Number of ECTS3Number of Nours of student's work1) Number of contact hours - 40 h, including: a) racticals - 30 h,: b) consultations - 10 3 (Sudent's work - 35 h, including: a) ilterature study - 10 h; b) student's preparation for tutorials - 10 h; b) student's preparation for tutorials - 10 h; b) eropearation aproject15 h; a) TorAL - 75 hNumber of ECTS point for classes requiring oriented studer.1.S ECTS points - 35 h, including: a) preparation aproject15 h; a) total student's preparation for tutorials - 10 h; b) esosultations - 10 hours b) esos	Exam		No	
Subject website - D. Student's contribution Number of ECTS 3 points 1) Number of contact hours – 40 h, including: student's work a) practicals – 30 h.; connected with b) consultations – 10 achieving learning 2) Student's own work – 35 h, including: a) literature study – 10 h; b) consultations – 10 2) Student's preparation for tutorials – 10 h; c) preparation a project15 h; 3) TOTAL – 75 h 1.5 ECTS points – number of contact hours – 40 hours, including: a) racticals – 30 hours; b) consultations – 10 hour wither of ECTS points 1.5 ECTS points – number of contact hours – 40 hours, including: a) practicals – 30 hours; b) consultations – 10 hour within practical 1.5 ECTS points – 35 h, including: obtained by a student's preparation for tutorials – 10 h b) preparation a project 15 h; Wumber of ECTS points 1.5 ECTS points – 35 h, including: obtained by a student a) student's preparation for tutorials – 10 h b) preparation a project 15 h; b) preparation a project 15 h; E. Additional information - Update date 3.10.2022 r.	References		 N. Christodoulakis, S. Kalyvitis, Structural Funds: Growth, Employment and the Environment, Publisher: Springer US, 2001. P. Porretta, G. Pes, Microfinance, EU Structural Funds and Capacity Building for Managing Authorities, Publisher: Palgrave Macmillan UK, 2016. A. Evans, The E.U. Structural Funds, Publisher: Oxford University Press, 1999. J. Kostka, Financing Roma Inclusion with European Structural Funds, Publisher: Routledge, 2018. E. Weiss, Innovativeness of industrial enterprises using European Union structural funds, Publisher: Vizja Press&IT, 2011. 	
D. Student's contribution Number of ECTS points Number of hours of student's work connected with achieving learning outcomes: 1) Number of contact hours – 40 h, including: a) practicals – 30 h.; b) consultations – 10 2) Student's work on work – 35 h, including: a) literature study – 10 h; b) student's preparation for tutorials – 10 h; c) preparation a project15 h; 3) TOTAL – 75 h Number of ECTS points for classes requiring direct participation of members of academic staff: 1.5 ECTS points – 10 hour Number of ECTS points obtained by a student within practical 1.5 ECTS points – 35 h, including: a) student's preparation for tutorials – 10 h b) preparation a project 15 h; E. Additional information Comments - Update date 3.10.2022 r.	Subject website		-	
NumberofECTS3Number of hours of student's work connected with achieving learning outcomes:1) Number of contact hours – 40 h, including: a) practicals – 30 h.; b) consultations – 10 2) Student's own work – 35 h, including: a) literature study – 10 h; b) student's preparation for tutorials – 10 h; c) preparation a project15 h; 3) TOTAL – 75 hNumber of ECTS points for classes requiring direct participation of members of academic staff:1.5 ECTS points – number of contact hours – 40 hours, including: a) practicals – 30 hours; b) consultations – 10 hourNumber of ECTS points direct participation of within practical1.5 ECTS points – 35 h, including: a) student's preparation for tutorials – 10 hourE. Additional information1.5 ECTS points – 35 h, including: a) student's preparation for tutorials – 10 h b) preparation a project 15 h; a) student's preparation for tutorials – 10 hourE. Additional information-Comments-Update date3.10.2022 r.	D. Student's contribution			
pointsImage: student's work connected with achieving learning outcomes:1) Number of contact hours - 40 h, including: a) practicals - 30 h.; b) consultations - 10 2) Student's own work - 35 h, including: a) literature study - 10 h; b) student's preparation for tutorials - 10 h; c) preparation a project15 h; 3) TOTAL - 75 hNumber of ECTS points for classes requiring direct participation of restricts1.5 ECTS points - number of contact hours - 40 hours, including: a) practicals - 30 hours; b) consultations - 10 hourNumber of ECTS points for classes requiring direct participation of members of academic staff:1.5 ECTS points - number of contact hours - 40 hours, including: a) practicals - 30 hours; b) consultations - 10 hourNumber of ECTS points obtained by a student's preparation for tutorials - 10 h b) preparation a project 15 h; a) student's preparation for tutorials - 10 h b) preparation a project 15 h; a) consultations - 10 hourE.Additional informative1.5 ECTS points - 35 h, including: a) student's preparation for tutorials - 10 h b) preparation a project 15 h; a) student's preparation for tutorials - 10 h b) preparation a project 15 h;E.Additional informative1.5 ECTS points - 35 h, including: a) student's preparation for tutorials - 10 h b) preparation a project 15 h;Mumber of ECTS points obtained by a student b) preparation a project 15 h;E.Additional informativeMumber of ECTS points - 35 h, including: a) student's preparation for tutorials - 10 h b) preparation a project 15 h;Mumber of ECTS points - 35 h, including: a) student's preparation for tutorials - 10 h b) preparation a project 15 h;Mumber of ECTS points -	Number	of ECTS	3	
Number of hours of student's work connected with achieving learning outcomes:1) Number of contact hours – 40 h, including: a) practicals – 30 h.; b) consultations – 10 2) Student's own work – 35 h, including: a) literature study – 10 h; b) student's preparation for tutorials – 10 h; c) preparation a project15 h; 3) TOTAL – 75 hNumber of ECTS points for classes requiring direct participation of members of academic staff:1.5 ECTS points – number of contact hours – 40 hours, including: a) practicals – 30 hours; b) consultations – 10 hourNumber of ECTS points for classes requiring direct participation of members of academic staff:1.5 ECTS points – number of contact hours – 40 hours, including: a) practicals – 30 hours; b) consultations – 10 hourNumber of ECTS points obtained by a student within practical1.5 ECTS points – 35 h, including: a) student's preparation for tutorials – 10 h b) preparation a project 15 h; a) Student's preparation for tutorials – 10 h b) preparation a project 15 h;E. Additional information Comments-Update date3.10.2022 r.	points			
Number of ECTS points for classes requiring direct participation of members of academic staff:1.5 ECTS points – number of contact hours – 40 hours, including: a) practicals – 30 hours; b) consultations – 10 hourNumber of ECTS points obtained by a student within practical1.5 ECTS points – 35 h, including: a) student's preparation for tutorials – 10 h b) preparation a project 15 h;E. Additional information-Comments-Update date3.10.2022 r.	Number of student's connected achieving outcomes	f hours of work l with learning :	 Number of contact hours - 40 h, including: a) practicals - 30 h.; b) consultations - 10 2) Student's own work - 35 h, including: a) literature study - 10 h; b) student's preparation for tutorials - 10 h; c) preparation a project15 h; 3) TOTAL - 75 h	
for classes requiring direct participation of members of academic staff:a) practicals – 30 hours; b) consultations – 10 hourNumber of ECTS points obtained by a student within practical1.5 ECTS points – 35 h, including: a) student's preparation for tutorials – 10 h b) preparation a project 15 h;E. Additional information-Comments Update date-3.10.2022 r.3.10.2022 r.	Number of ECTS points		1.5 ECTS points – number of contact hours – 40 hours, including:	
Number of ECTS points obtained by a student within practical1.5 ECTS points - 35 h, including: a) student's preparation for tutorials - 10 h b) preparation a project 15 h;E. Additional information-Comments-Update date3.10.2022 r.	for class direct pa members staff:	es requiring rticipation of of academic	a) practicals – 30 hours; b) consultations – 10 hour	
obtained by a student within practicala) student's preparation for tutorials – 10 h b) preparation a project 15 h;E. Additional information-Comments-Update date3.10.2022 r.	Number o	of ECTS points	1.5 ECTS points – 35 h, including:	
within practicalb) preparation a project 15 h;E. Additional informationComments-Update date3.10.2022 r.	obtained	by a student	a) student's preparation for tutorials – 10 h	
E. Additional information Comments Update date 3.10.2022 r.	within pr	actical	b) preparation a project 15 h;	
Comments-Update date3.10.2022 r.	E. Additional information			
Update date 3.10.2022 r.	Comment	S	-	
	Update dat	e	3.10.2022 r.	