Wrocław University of Science and Technology

Study programme

Organizational unit:	Faculty of Mechanical and Power Engineering
Field of study:	Power Engineering
Level of study:	second degree 3 semesters
Form of study:	full-time studies
Education cycle:	2025/2026

Table of contents

Field of study characteristics

Basic information

Organizational unit:	Faculty of Mechanical and Power Engineering
Field of study:	Power Engineering
Study level:	second degree 3 semesters
Study form:	full-time studies
Education profile:	general academic profile
Language of study:	English
Valid from the education cycle:	2025/2026
Number of semesters:	3
Total number of hours of classes:	directional: 645 Refrigeration and Cryogenics: 405 Renewable Sources of Energy: 405 Computer Aided Mechanical and Power Engineering: 405
Total number of ECTS points required to complete a given level of study:	90
Professional title awarded to graduates:	magister inżynier

Fields of science and scientific disciplines

Scientific disciplines to which the field of study is assigned:

Field engineering and technical sciences

Assigning the major to the fields and disciplines to which the learning outcomes relate:

Discipline	Percentage
Environmental engineering, mining and energy	100%

Main discipline: Environmental engineering, mining and energy

Description of the field, profile of the graduate and possibilities of continuing studies

Master's degree studies in Power Engineering provide students with advanced theoretical knowledge and practical skills in the field of modern energy technologies. The curriculum covers both conventional and innovative technologies for energy generation, distribution, and management, with an emphasis on energy efficiency and sustainable development. Graduates are prepared to work in the dynamically evolving energy sector, as well as to undertake scientific research. Knows a foreign language at the B2+ proficiency level and a second foreign language at the A1 or A2 level. Completion of the program also opens opportunities for further education in postgraduate studies or doctoral schools.

Computer Aided Mechanical and Power Engineering specialization:
He has knowledge and skills in advanced technologies and methods of process research and operation of machinery and equipment in energy and industry. He is prepared for modeling, simulation, optimization and implementation of new energy technologies, as well as for work in local government bodies and independent business. Has knowledge and skills in the use of advanced computer tools to support work in the energy and mechanical industries.

Renewable Sources of Energy specialization:

He has knowledge and skills in advanced technologies and methods of process research and operation of machinery and equipment in energy and related industries. He is prepared to design, optimize and implement new energy technologies, especially in the field of renewable energy sources, as well as to work in local government bodies and independently conduct business in the conditions of the energy market and the implementation of the principle of sustainable development.

Refrigeration and Cryogenics specialization:
He has knowledge and skills in: design, manufacturing and operation of machinery and manufacturing systems, as well as environmental technologies and technical safety. He is prepared to: creatively use methods and information technologies to support the design, manufacture and operation of power generation machinery and equipment; direct and develop production in industrial enterprises and manage technological processes; conduct research in scientific and research institutes; manage design laboratories in the field of power generation equipment design and technological processes; conduct business. Has the necessary knowledge and skills in the design, testing and operation of machinery and equipment generating low temperatures down to -35°C in refrigeration and in the range from 120 K (-153°C) to fractions of Kelvin in cryogenics, among others, for technical, scientific and medical purposes.

Currentness of the study programme

Concept and goals of education

The concept of education in Power Engineering aligns with the Development Strategy of Wrocław University of Science and Technology and the Development Plan of the Faculty of Mechanics and Energy. This plan defines the Faculty’s mission as: "Technical development in the fields of energy, mechanical, and aeronautical engineering through university education, advanced scientific research, and close cooperation with regional, national, and international industries." These objectives ensure the Faculty's continuous presence in the educational, research, implementation, and expert domains, both nationally and internationally, with a particular focus on the Lower Silesia region.

The profile of the Power Engineering program aligns with the current Development Strategy of the Lower Silesian Voivodeship, which emphasizes, among other priorities, the importance of broad educational and professional development opportunities, aligning the educational offer with labor market needs, and strengthening regional human and social capital by improving the effectiveness of education.

During their studies, students participate in university-organized classes and are encouraged to engage in other knowledge-expanding and skill-enhancing activities, such as joining research groups, student organizations, or sports and cultural initiatives. They also have opportunities to take part in international student exchanges, study visits, job fairs, and meetings with industry representatives related to their field of study.

Information regarding the inclusion of socio-economic needs in the study programme and the compliance of the major learning outcomes with these needs

The assumed learning outcomes ensure the increment of engineering competencies obtained at the first level of education, mainly in terms of knowledge and skills, with a particular emphasis on creativity in solving specific technical problems. Thus, the study program equips the graduate with attributes that enable him to adapt to the dynamically changing requirements of the labor market.

In a broader professional perspective, employees with technical education and skills in analytical thinking, building quantitative models and mathematical analysis of phenomena and processes related to energy generation, conversion and distribution are desired in the labor market. The assumed educational results correspond to the expectations of employers regarding knowledge, skills and also broad-mindedness and the general culture of the candidate employee.

Other important factors determining the validity of the study programme

The University and the Faculty of Mechanical and Power Engineering place great emphasis on developing students' skills, supported by the infrastructure of modern laboratories and the expertise of the scientific and teaching staff. To maintain the effectiveness of education, continuous monitoring of market needs is carried out, and educational plans and programs are regularly updated.

The measure of the alignment between education in the field of Power Engineering and the scientific activities of the Faculty of Mechanical and Power Engineering is reflected in numerous publications, including articles (some of which are authored or co-authored by students), textbooks, monographs, patents, projects/grants, and industrial orders carried out by academic staff and doctoral

students, often with the involvement of students from the field.

The core content of education, including that related to the results of scientific activity, aligns with the profile of scientific research conducted at the Faculty of Mechanical and Power Engineering in the discipline of Environmental Engineering, Mining and Energy. In areas where research is not conducted at the home faculty classes are taught by staff from other faculties specializing in these fields. This ensures that the knowledge, skills, and experience of academic teachers guarantee that the educational content is up to date and maintains a high level of academic quality.

The Faculty authorities place great importance on the system for creating, improving, and monitoring study programs. Key elements of the ongoing monitoring process include observing didactic classes, conducting surveys of students' opinions regarding the fulfillment of teaching duties by academic staff, and assessing learning outcomes according to the procedures established at the Faculty.

The participation and involvement of students are crucial in creating, improving, and monitoring study programs. Students are members of the Program Committees and the Faculty Committee for the Quality of Education. As such, they have the opportunity to propose changes to study programs, provide feedback to the student community, and engage in ongoing discussions on the modification and improvement of the study programs.

The connection of the programme with the University's mission and its development strategy

The Power Engineering program aligns with the mission, vision, and strategy of Wrocław University of Science and Technology by educating specialists who will be responsible for the future of modern energy technologies. It fulfills the university's mission by inspiring and supporting the development of socially conscious and ethical innovation leaders. The program reflects the vision of interdisciplinary education and research, combining engineering, computer science, and modern solutions in energy generation, storage, and distribution. It supports the university's strategic areas, such as modern education, research on advanced energy technologies, and cooperation with industry, thereby strengthening the prestige of Wrocław University of Science and Technology. Moreover, this program contributes to the development of efficient, safe, and sustainable energy systems, addressing global challenges related to the energy transition and environmental protection.

Learning outcomes

Code	Description of the directional learning outcome	Characteristics for qualifications at level 6 or 7 of the Polish Qualifications Framework	Characteristics for qualifications at level 6 or 7 of the Polish Qualifications Framework, enabling the acquisition of engineering competences
Knowledge			
K2_ENG_W01	has a structured knowledge of mathematics useful for formulating and solving energy problems	P7S_WG	
K2_ENG_W02	has a structured knowledge of physics necessary to understand the processes used in the energy industry	P7S_WG	
K2_ENG_W03	has a structured knowledge of numerical methods, programming and mathematical modeling useful for solving simple scientific and engineering problems	P7S_WG	P7S_WG_INŻ
K2_ENG_W04	has an in-depth knowledge of thermodynamics, heat transfer, and fluid mechanics fundamental to technologies used in the energy industry	P7S_WG	P7S_WG_INŻ
K2_ENG_W05	has knowledge of development trends and the most significant achievements related to the latest technologies and systems used in the power industry, the directions of their development and the problems associated with their implementation	P7S_WG	P7S_WG_INŻ
K2_ENG_W06	has knowledge of the measurement of basic process parameters in the power industry and the control of these processes	P7S_WG	P7S_WG_INŻ
K2_ENG_W07	has a well-established knowledge of fuels, agents and fluids used in the energy industry and the safety of their use	P7S_WG	P7S_WG_INŻ
K2_ENG_W08	has a structured knowledge of the materials used and the methods of designing and manufacturing machinery, equipment and energy systems	P7S_WK	P7S_WG_INŻ
K2_ENG_W09	has the knowledge necessary to understand the social, economic, legal and other non-technical conditions of engineering activities, including management and business, including in the area of individual entrepreneurship	P7S_WK	P7S_WG_INŻ
Skills			
K2_ENG_U01	is able to obtain information from literature, databases and other sources; is able to integrate obtained information, interpret it, as well as draw conclusions and formulate and justify opinions	P7S_UW, P7S_UU	P7S_UW_INŻ
K2_ENG_U02	Has the ability to self-educate, is able to work individually and as part of a team; is able to estimate the time needed to complete the assigned task; is able to develop and implement a work schedule to ensure deadlines are met	P7S_UW, P7S_UU, P7S_UO	P7S_UW_INŻ
K2_ENG_U03	is able to develop documentation on the implementation of an engineering task and prepare a text containing a discussion of the results of the task	P7S_UW, P7S_UU	P7S_UW_INŻ
K2_ENG_U04	is able to prepare and present a short presentation on the results of an engineering task	P7S_UW, P7S_UK, P7S_UU	P7S_UW_INŻ
K2_ENG_U05	is able to - when formulating and solving scientific and engineering tasks, integrate knowledge of energy and mathematics	P7S_UW	P7S_UW_INŻ

Code	Description of the directional learning outcome	Characteristics for qualifications at level 6 or 7 of the Polish Qualifications Framework	Characteristics for qualifications at level 6 or 7 of the Polish Qualifications Framework, enabling the acquisition of engineering competences
K2_ENG_U06	is able - with the help of computer tools - to solve complex, advanced problems of heat transfer and fluid mechanics, to program and mathem	P7S_UW	P7S_UW_INŻ
K2_ENG_U07	is able to plan and conduct experimental studies, including measurements of basic operating parameters, interpret the obtained results and draw conclusions about the operation of energy systems	P7S_UW	P7S_UW_INŻ
K2_ENG_U08	is able to develop a conceptual technological design, conduct an energy and technical-economic analysis, and prepare design specifications for the components of a machine, equipment or energy system	P7S_UW	P7S_UW_INŻ
K2_ENG_U09	is able to use theoretical knowledge to perform thermodynamic calculations of complex energy conversion systems, perform analysis and evaluate the efficiency of energy processes, installations and systems	P7S_UW	P7S_UW_INŻ
Social competence			
K2_ENG_K01	understands the need for and knows the possibilities of continuous training (doctoral school, postgraduate studies, courses) - improving professional, personal and social competence	P7S_KK	
K2_ENG_K02	is aware of the importance and understanding of the non-technical aspects and consequences of the activities of a power engineer, including its impact on the environment and the associated responsibility for decision-making. and the necessity of individual and team activity beyond engineering activities	P7S_KK, P7S_KO, P7S_KR	
K2_ENG_K03	is aware of the responsibility for his own work and is ready to follow the rules of teamwork and take responsibility for jointly implemented tasks	P7S_KO, P7S_KR	
K2_ENG_K04	can think and act in a creative and entrepreneurial way	P7S_KO	
K2_ENG_K05	is aware of the social role of a graduate of a technical university, and in particular understands the need to formulate and communicate to the public - including through the mass media - information and opinions on energy activities; makes efforts to communicate such information and opinions in a reliable and widely understood manner	P7S_KO, P7S_KR	
Language outcomes			
SJO_S2_U01	Be able to use a foreign language at B2+ ESCJ level and specialised terminology	P7S_UK	

Detailed information on ECTS points

Power Engineering

Name	Renewable Sources of Energy	Computer Aided Mechanical and Power Engineering	Refrigeration and Cryogenics
Total ECTS	90	90	90
Total number of hours of classes	1050	1050	1050
Number of ECTS points assigned to classes related to scientific activities conducted at the university in the discipline or disciplines to which the field of study is assigned (DN)	75/90 (83.33%)	75/90 (83.33%)	75/90 (83.33%)
Number of ECTS points allocated to classes developing practical skills (including laboratory, project) (P)	49.8	51.8	47.9
The number of ECTS points that a student will receive by completing classes that require the direct participation of academic teachers or other persons conducting classes and students (BU)	46	46	46
Percentage of ECTS for elective courses	54/90 (60%)	54/90 (60%)	54/90 (60%)
The number of ECTS points that a student will receive by completing classes in the humanities or social sciences appropriate for a given field of study	5	5	5
The number of ECTS points that a student will receive by completing classes in basic sciences (mathematics, physics/chemistry)	5	5	5

Organization of studies

Implementation of the study programme

Allowable ECTS deficit

Semester	Allowable deficit of ECTS points after a semester
Semester 1	7
Semester 2	7
Semester 3	0

Detailed requirements

Not applicable.

Methods of verifying the intended learning outcomes

Activity form	Methods of verifying the intended learning outcomes
Classes	Credit - oral, written; short test, input task, evaluation of the sub-tasks; practical exam, model, essay, paper
Project	Project preparation, project implementation, project documentation, case study analysis, model
Seminar	Multimedia presentations conducted and prepared individually or in groups; case study analysis, class participation, paper
Laboratory	Preparation of laboratory reports; oral statements, class participation; short test, input task, evaluation of the sub-tasks
Diploma thesis	Assessment of the diploma thesis implementation
Lecture	Exam - oral, written, credit, test - oral, written

Description of the process leading to achieving learning outcomes

A student entering a course has the necessary knowledge and skills, which are prerequisites for the course/subject. The student attends classes organized at the University, takes advantage of consultations and does work at home to acquire the necessary knowledge and develop skills. In lectures, the knowledge necessary for a graduate is imparted, and in classes students are motivated to discuss and work on their own outside of class. Subjects of a practical nature allow students to acquire skills and competencies. Classes are implemented in small teams and are conducted in such a way as to allow discussion, presentation of the results of own work and learning to solve problems, including those of a research nature. The student is periodically subjected to verification of his/her own knowledge and skills during examinations, credit colloquia, interim papers, midterms, etc. The student has the opportunity and is encouraged to use other forms of improving knowledge and skills, and which are not part of the study program, such as work in student organizations or study circles. The student participates in meetings with entrepreneurs representing the industry related to the field of study.

The staffing of teaching assignments follows the academic tradition of assigning teaching assignments based on the academic achievements and professional experience of the teaching staff. When planning teaching staffing, the following are taken into account: the competence and predisposition of academic teachers to teach a given subject, the results of surveys and, in particular, the opinions of students expressed in surveys and during post-session meetings, the results of hospitalizations, and the possibly even load of teaching duties on the Staff.

Internships

Not applicable.

Diploma exam

The diploma exam consists of a presentation of the diploma thesis and an exam, during which the student answers questions from areas corresponding to the field of study. A detailed list of topics for the diploma exam in a given academic year is prepared in consultation with the teachers of individual subjects (to ensure alignment with the program content of the Aerospace engineering major). After approval by the Program Committee of the field of study, it is published on the Faculty's website before the start of the semester in which the diploma exam is scheduled. The diploma exam is conducted in accordance with the requirements set out in the Study Regulations at Wrocław University of Science and Technology and the Internal Procedure for the Organization and Conduct of the Diploma Exam. The condition for a student to take the diploma exam is the completion of all learning outcomes specified by the Senate of Wrocław University of Science and Technology for the second-cycle program in the Aerospace engineering major and the receipt of a positive grade for the diploma thesis.

Study plan

Power Engineering

Semester 1

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Applied Mathematics	Lecture: 30 Classes: 30	Lecture: Exam Classes: Graded credit	Lecture: 2 Classes: 2	Obligatory
Physics - Selected Issues	Lecture: 15	Graded credit	1	Obligatory
Mechatronics and Control Systems	Lecture: 30 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 2 Laboratory: 2	Obligatory
Selected Problems of Thermal-Flow Processes	Lecture: 15 Laboratory: 15	Lecture: Graded credit Laboratory: Graded credit	Lecture: 1 Laboratory: 1	Obligatory
New Generation Energy Technologies	Lecture: 30	Graded credit	2	Obligatory
Physics of Renewable Energy	Lecture: 30 Project: 15 Seminar: 15	Lecture: Exam Project: Graded credit Seminar: Graded credit	Lecture: 3 Project: 1 Seminar: 1	Obligatory
Modeling of HVAC Systems	Lecture: 15 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 1 Laboratory: 2	Obligatory
Low-Temperature Technologies	Lecture: 30 Classes: 15	Lecture: Exam Classes: Graded credit	Lecture: 2 Classes: 1	Obligatory
Finite Element Analysis	Lecture: 30 Laboratory: 30	Lecture: Exam Laboratory: Graded credit	Lecture: 2 Laboratory: 2	Obligatory
Foreign Language 2.1	Classes: 30	Graded credit	2	Obligatory group
The student chooses one language subject from the university's offer				
Foreign Language 2.1	Classes: 30	Graded credit	2	Elective
Sum	**435**		**30**	

Semester 2

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
CFD Simulations of Power Generation Units	Lecture: 30 Laboratory: 30	Lecture: Exam Laboratory: Graded credit	Lecture: 3 Laboratory: 2	Obligatory
Modeling of Energy Systems	Lecture: 15 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 1 Laboratory: 2	Obligatory
Management Course	Lecture: 30	Graded credit	3	Obligatory group
The student chooses one subject				
Project Management at Energy Sector	Lecture: 30	Graded credit	3	Elective
Team Management	Lecture: 30	Graded credit	3	Elective
Foreign Language 2.2	Classes: 60	Graded credit	3	Obligatory group
The student chooses one language subject from the university's offer				
Foreign Language 2.2	Classes: 60	Graded credit	3	Elective
Sum	**195**		**14**	

Computer Aided Mechanical and Power Engineering

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Modeling of Combustion Processes	Lecture: 15 Laboratory: 30	Lecture: Exam Laboratory: Graded credit	Lecture: 2 Laboratory: 2	Obligatory in specialty
Advanced Numerical Modeling Using OpenFOAM	Lecture: 15 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 1 Laboratory: 2	Obligatory in specialty
Fundamentals of Programming	Lecture: 15 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 1 Laboratory: 2	Obligatory in specialty
Advanced Data Processing	Lecture: 15 Laboratory: 30	Lecture: Graded credit Laboratory: Graded credit	Lecture: 1 Laboratory: 2	Obligatory in specialty
Numerical Methods	Lecture: 15 Laboratory: 30	Lecture: Exam Laboratory: Graded credit	Lecture: 1 Laboratory: 2	Obligatory in specialty
Sum	**225**		**16**	

Renewable Sources of Energy

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Biomass and Biofuels in Energy Production	Lecture: 30 Laboratory: 15 Project: 15	Lecture: Exam Laboratory: Graded credit Project: Graded credit	Lecture: 2 Laboratory: 1 Project: 1	Obligatory in specialty
Solar Energy Conversion System	Lecture: 15 Laboratory: 15 Project: 15	Lecture: Exam Laboratory: Graded credit Project: Graded credit	Lecture: 1 Laboratory: 1 Project: 1	Obligatory in specialty
Fuel Cells and Hydrogen Production	Lecture: 30 Laboratory: 15	Lecture: Graded credit Laboratory: Graded credit	Lecture: 2 Laboratory: 1	Obligatory in specialty
Water Power Engineering	Lecture: 15 Laboratory: 15 Project: 15	Lecture: Graded credit Laboratory: Graded credit Project: Graded credit	Lecture: 1 Laboratory: 1 Project: 1	Obligatory in specialty
Wind Power Plants	Lecture: 15 Project: 15	Lecture: Graded credit Project: Graded credit	Lecture: 1 Project: 2	Obligatory in specialty
Sum	**225**		**16**	

Refrigeration and Cryogenics

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Coolling Systems	Lecture: 30 Project: 15	Lecture: Graded credit Project: Graded credit	Lecture: 2 Project: 2	Obligatory in specialty
Applied Cryogenics in Power Engineering	Lecture: 30	Graded credit	2	Obligatory in specialty
Air Conditioning Systems	Lecture: 15 Laboratory: 15	Lecture: Graded credit Laboratory: Graded credit	Lecture: 1 Laboratory: 1	Obligatory in specialty
Vapor-Compression Refrigeration Systems	Lecture: 30 Laboratory: 15	Lecture: Exam Laboratory: Graded credit	Lecture: 2 Laboratory: 1	Obligatory in specialty
Cryogenics	Lecture: 30 Laboratory: 30 Project: 15	Lecture: Exam Laboratory: Graded credit Project: Graded credit	Lecture: 2 Laboratory: 2 Project: 1	Obligatory in specialty
Sum	**225**		**16**	

Semester 3

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Humanities Course	Lecture: 15	Graded credit	2	Obligatory group
The student chooses one subject				
Psychology of Communication	Lecture: 15	Graded credit	2	Elective
Communication in a Multicultural Environment	Lecture: 15	Graded credit	2	Elective
Sum	**15**		**2**	

Computer Aided Mechanical and Power Engineering

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Artificial Intelligence	Lecture: 15 Laboratory: 15	Lecture: Graded credit Laboratory: Graded credit	Lecture: 1 Laboratory: 1	Obligatory in specialty
Thermodynamic Analysis of Energy Processes	Lecture: 15 Classes: 15	Lecture: Graded credit Classes: Graded credit	Lecture: 1 Classes: 1	Obligatory in specialty
Integrated Production Systems	Lecture: 15 Laboratory: 15	Lecture: Graded credit Laboratory: Graded credit	Lecture: 1 Laboratory: 1	Obligatory in specialty
Master Thesis	Diploma thesis: 60	Graded credit	20	Obligatory in specialty
Master Seminar	Seminar: 30	Graded credit	2	Obligatory in specialty
Sum	**180**		**28**	

Renewable Sources of Energy

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Geothermal Power Engineering	Lecture: 15 Classes: 15	Lecture: Graded credit Classes: Graded credit	Lecture: 1 Classes: 1	Obligatory in specialty
Thermonuclear Power Generation	Lecture: 15 Seminar: 15	Lecture: Graded credit Seminar: Graded credit	Lecture: 1 Seminar: 1	Obligatory in specialty

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Heat Pumps	Lecture: 15 Project: 15	Lecture: Graded credit Project: Graded credit	Lecture: 1 Project: 1	Obligatory in specialty
Master Thesis	Diploma thesis: 60	Graded credit	20	Obligatory in specialty
Master Seminar	Seminar: 30	Graded credit	2	Obligatory in specialty
Sum	**180**		**28**	

Refrigeration and Cryogenics

Subject	Number of hours	Form of verification	ECTS points	Mandatoriness
Cold Chain	Lecture: 15	Graded credit	1	Obligatory in specialty
Cryogenic Systems and Applied Superconductivity	Lecture: 30 Project: 15	Lecture: Graded credit Project: Graded credit	Lecture: 2 Project: 1	Obligatory in specialty
Sorption Refrigeration	Lecture: 15 Classes: 15	Lecture: Graded credit Classes: Graded credit	Lecture: 1 Classes: 1	Obligatory in specialty
Master Thesis	Diploma thesis: 60	Graded credit	20	Obligatory in specialty
Master Seminar	Seminar: 30	Graded credit	2	Obligatory in specialty
Sum	**180**		**28**	

Syllabuses

Wrocław University of Science and Technology

Applied Mathematics

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
-

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory

Block
Subjects of basic education - mathematics

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 30 h, 2 ECTS, Exam • Classes: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Student understands how the physical aspect of processes occurring in technology is described mathematically in the form of algebraic and differential equations.	K2_ENG_W01
PEU_W02	When dealing with a mathematical problem (e.g. an algebraic or differential equation), student distinguishes between exact and approximate solutions and understands the relationships between them.	K2_ENG_W01
In terms of skills		
PEU_U01	Student indicates equations (algebraic or differential) describing physical phenomena in the studied technical processes.	K2_ENG_U05
PEU_U02	Student is able to select a correct tools to solve an identified mathematical problem.	K2_ENG_U05

PEU_U03	Student solves ordinary or partial differential equations using appropriate analytical and numerical methods, assess their accuracy and interpret the physical and technical meaning of the obtained results.	K2_ENG_U05

Program content ensuring learning outcomes

The course provides an overview of analytical methods and numerical techniques for solving first and second order ordinary differential equations. For partial differential equations, the canonical form of second order differential equations is discussed and solutions of parabolic, hyperbolic and elliptic equations are presented.
Getting acquainted with the selected ordinary and partial differential equations is necessary to understand the mathematical description of physical phenomena occurring in devices and technical processes.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	30
Credit/Exam	6
Preparaton for classes	20
Self-development of practical skills	14
Student workload	**Hours** 100

Wrocław University of Science and Technology

Physics - Selected Issues

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
-

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory

Block
Subjects of basic education - physics

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student describes and explains the phenomenon of superfluidity and superconductivity and explains the BCS theory of superconductivity.	K2_ENG_W02
PEU_W02	The student categorizes elementary particles and explains the principles of conservation of baryon number, lepton number and strangeness.	K2_ENG_W02
PEU_W03	The student describes and explains the wave function and operators.	K2_ENG_W02
PEU_W04	The student identifies and explains strong and weak interactions.	K2_ENG_W02
PEU_W05	The student recognizes and explains the structure of the atomic nucleus and explains the shell and liquid drop model of the atomic nucleus.	K2_ENG_W02

Program content ensuring learning outcomes

The lecture includes a discussion of quantum phenomena relevant to energy processes. In particular, the lecture will cover the following issues: wave functions, operators, superfluidity, superconductivity, particle physics, weak and strong interactions, atomic nucleus models, nuclear reaction physics.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Self-study of class topics	4
Preparation for an exam/credit	4
Credit/Exam	2
Student workload	**Hours** 25

Wrocław University of Science and Technology

Mechatronics and Control Systems

Educational subject description sheet

Basic information

Field of study Power Engineering **Speciality** - **Organizational unit** Faculty of Mechanical and Power Engineering **Study level** second degree 3 semesters **Study form** full-time studies **Education profile** general academic profile	**Education cycle** 2025/2026 **Subject code** **Lecture languages** English **Mandatoriness** Obligatory **Block** Major-specific subjects **Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 30 h, 2 ECTS, Graded credit • Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student is able to define and implement the model of a mechatronic system	K2_ENG_W06
PEU_W02	The student has the basic knowledge regarding sensors	K2_ENG_W06
PEU_W03	The student knows the fundamentals of microcontroller programming and has knowledge of the construction and the principle of operation of a simple microprocessor controller.	K2_ENG_W06
PEU_W04	The student knows the fundamentals of PLC programming	K2_ENG_W06
PEU_W05	The student has knowledge of technical solutions used in mechatronic drive systems.	K2_ENG_W06
In terms of skills		

PEU_U01	The student is able to indicate, determine and determine the parameters of mechatronic objects	K2_ENG_U07
PEU_U02	The student is able to build the simplest control system based on a microcontroller.	K2_ENG_U07
PEU_U03	The student is able to select sensors (sensors) and actuators (actuators) appropriately for a given mechatronic object and type of application.	K2_ENG_U07
PEU_U04	The student is able to write simple programs for a PLC to support a given production process.	K2_ENG_U07
PEU_U05	The student is able to couple electromechanical and electropneumatic actuators to a PLC.	K2_ENG_U07

Program content ensuring learning outcomes

Acquisition of basic knowledge regarding mechatronic systems, their construction, design and methods of their control in particular: learning the basics of microprocessor technology, learning the methodology of creating and running programs for microcontrollers. To become acquainted with the construction, applications and methods of programming PLCs and cooperating executive systems containing sensors, measuring transducers and actuators (actuators). An acquisition of the ability to design basic control algorithms for mechatronic systems and to develop simple programs in high-level language (C/C++).
Translated with DeepL.com (free version)

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Preparaton for classes	8
Preparation of a report/summary/presentation/paper	25
Credit/Exam	2
Preparation for an exam/credit	5
Student workload	**Hours** 100

Wrocław University of Science and Technology

Selected Problems of Thermal-Flow Processes

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
-

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 15 h, 1 ECTS, Graded credit • Laboratory: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	defines issues related to equations describing heat transfer and fluid flow	K2_ENG_W01, K2_ENG_W02, K2_ENG_W04
PEU_W02	describes issues related to phenomenon of turbulence and its models	K2_ENG_W04
PEU_W03	defines issues related to numerical methods for solving heat transfer problems	K2_ENG_W01, K2_ENG_W04
PEU_W04	formulates and describes heat transfer issues in the context of phase change and radiation	K2_ENG_W02, K2_ENG_W04
In terms of skills		
PEU_U01	generates geometry and numerical grids	K2_ENG_U07

PEU_U02	selects the appropriate flow model in multiphase flows	K2_ENG_U07
PEU_U03	performs calculations and interprets the results of simulations of thermal phenomena in multiphase flows involving radiation	K2_ENG_U05, K2_ENG_U07

Program content ensuring learning outcomes

The program content of the subject includes solving problems of unsteady heat transfer, problems related to turbulent flow (modeling of turbulence and near-wall phenomena) and multiphase flow (multiphase flows, flow with discrete phase). Thermal-flow problems are discussed, also including phase change (for example condensation) and radiative heat transfer.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	15
Credit/Exam	2
Preparaton for classes	10
Preparation of a report/summary/presentation/paper	8
Student workload	**Hours** 50

Wrocław University of Science and Technology

New Generation Energy Technologies

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
-

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	knows the issues related to the development trends and the most significant achievements related to the latest technologies used in the conventional power industry, the directions of their development, and the problems associated with their implementation	K2_ENG_W05
PEU_W02	presents and discusses modern technologies used in nuclear energy and characterizes the main trends in their development	K2_ENG_W05
PEU_W03	presents and discusses the fundamental aspects of nuclear fusion and key experimental achievements in fusion technology in the context of energy production	K2_ENG_W05

Program content ensuring learning outcomes

The information presented during the course of the course allows the student to become familiar with the issues of modern

solutions of conventional, nuclear, and thermonuclear power generation.
Technological solutions used in modern systems of electricity and heat generation are discussed in detail. The impact of electricity and heat generation technologies on the environment and the costs of construction and the operation of these technologies is discussed. Currently, technologies used in conventional, nuclear, and thermonuclear power generation are presented. The directions of development of these technologies are discussed, and the steps taken to acquire modern, future-orientated energy sources are presented.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Preparation for an exam/credit	13
Self-study of class topics	5
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Physics of Renewable Energy

Educational subject description sheet

Basic information

Field of study Power Engineering **Speciality** - **Organizational unit** Faculty of Mechanical and Power Engineering **Study level** second degree 3 semesters **Study form** full-time studies **Education profile** general academic profile	**Education cycle** 2025/2026 **Subject code** **Lecture languages** English **Mandatoriness** Obligatory **Block** Major-specific subjects **Subject related to scientific research** Yes

Semester	**Activities, hours, ECTS and examination**
Semester 1	• Lecture: 30 h, 3 ECTS, Exam • Project: 15 h, 1 ECTS, Graded credit • Seminar: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	the student has well-ordered and theoretically grounded detailed knowledge related to the issues of physical phenomena and processes used in power engineering from renewable sources, as well as the most important new developments and development trends in the field of power engineering from renewable sources	K2_ENG_W02, K2_ENG_W05
In terms of skills		
PEU_U01	the student is able to acquire information from literature, databases and other sources; to critically evaluate them, on this basis student can design a simple energy system based on renewable energy sources, taking into account preliminary economic analysis, and is able to draw conclusions and formulate and fully justify opinions as well as to prepare a report	K2_ENG_U08

PEU_U02	student is able to prepare and present a presentation on a topic related to renewable energy, lead a discussion and evaluate its progress	K2_ENG_U04

Program content ensuring learning outcomes

To familiarize students in detail with the physical phenomena and processes used in renewable energy, taking into account new developments and development trends.
To develop the ability to effectively acquire, critically evaluate and use information, concerning renewable energy sources, for application purposes.
Preparing students to carry out project tasks, taking into account the use of current developments related to physics and materials engineering.
To develop the ability to properly develop, present and publicly discuss the results of literature studies and project work

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Project	15
Seminar	15
Preparaton for classes	15
Self-study of class topics	16
Preparation for an exam/credit	6
Credit/Exam	4
Conducting literature research	5
Preparation of a project	12
Preparation of a report/summary/presentation/paper	7
Student workload	**Hours** 125

Wrocław University of Science and Technology

Modeling of HVAC Systems

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
-

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 15 h, 1 ECTS, Graded credit • Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the various elements of the HVAC system.	K2_ENG_W05
PEU_W02	Has knowledge of the principles of operation and use of HVAC systems.	K2_ENG_W05
In terms of skills		
PEU_U01	Student is able to present devices included in the HVAC installation.	K2_ENG_U09
PEU_U02	Student is able to choose the parameters of the HVAC installation.	K2_ENG_U09

Program content ensuring learning outcomes

Familiarizing students with various HVAC systems, the structure and operating parameters of HVAC systems and examples

of existing implementations.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	30
Preparaton for classes	3
Preparation for an exam/credit	5
Credit/Exam	2
Preparation of a report/summary/presentation/paper	20
Student workload	**Hours** 75

Wrocław University of Science and Technology

Low-Temperature Technologies

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
-

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 30 h, 2 ECTS, Exam • Classes: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student knows the physical basis of low temperature processes. Selects refrigeration and cryogenic technologies depending on the needs. Calculates the efficiency of low temperature cycles. Understands the importance and applications of low temperature technologies in energy conversion and power engineering.	K2_ENG_W05, K2_ENG_W07
In terms of skills		
PEU_U01	Knows the individual temperature reduction processes and their limitations.	K2_ENG_U09
PEU_U02	Is able to link physical processes with the technologies enabling their implementation.	K2_ENG_U09
PEU_U03	Is able to assess the feasibility of using low-temperature processes in power generation.	K2_ENG_U09

Program content ensuring learning outcomes

Thermodynamic basis of achieving low and very low temperatures. Phenomenological and statistical approach. Unattainability of absolute zero. Refrigeration and cryogenic technologies and their importance in energy transformation. Low-temperature technologies in large-scale scientific research.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Classes	15
Preparaton for classes	16
Conducting literature research	10
Credit/Exam	4
Student workload	**Hours** 75

Wrocław University of Science and Technology

Finite Element Analysis

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
-

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 1	• Lecture: 30 h, 2 ECTS, Exam • Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the theory of the Finite Element Method and its potential applications in developing advanced computational procedures for thermal and strength analyses	K2_ENG_W03
PEU_W02	Has knowledge in the development and preparation of numerical models based on the FEM algorithm for conducting multi-variant research analyses	K2_ENG_W03
PEU_W03	Has knowledge of the limitations and capabilities of applying FEM analysis for the numerical verification of operating conditions of individual components and structural systems	K2_ENG_W03, K2_ENG_W08
In terms of skills		
PEU_U01	Has acquired the ability to apply the FEM algorithm in the preparation and execution of numerical research analyses	K2_ENG_U06

PEU_U02	Is able to create and apply an appropriate type of FEM-based numerical model depending on the problem being solved	K2_ENG_U06
PEU_U03	Is able to carry out a correct and critical interpretation of the results obtained from FEM-based numerical research analyses	K2_ENG_U06

Program content ensuring learning outcomes

As part of the course, students will acquire the ability to apply the theory of the Finite Element Method (FEM) in conducting complex numerical research analyses, covering topics in the fields of strength of materials and heat transfer. The methodology for correctly and systematically modeling real-world objects and phenomena will be presented. Based on FEM algorithms, this methodology will allow for the numerical verification of operating conditions for individual components as well as entire structural systems. In the conducted numerical studies, various possible scenarios are developed and evaluated to reflect the actual working conditions of the analyzed elements. Comparative analyses of the obtained model results aim to identify the most critical structural risks, as well as to support the development of safe and optimal solutions. In preparing and conducting the research simulations and interpreting the obtained results, emphasis is placed on understanding the limitations and capabilities of the FEM algorithm, as well as on developing the ability to critically analyze FEM results. The course will also cover topics that enable correct interpretation of how the adopted modeling assumptions, for complex loading states and thermal interactions, affect the resulting deformations and the structural strength.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Credit/Exam	4
Preparation for an exam/credit	14
Preparation of a report/summary/presentation/paper	22
Student workload	**Hours** 100

Wrocław University of Science and Technology

Foreign Language 2.1

Educational subject description sheet

Basic information

Field of study lektoraty	**Education cycle** 2025/2026
Speciality -	**Subject code** SJO000-25SM02684C
Organizational unit Wrocław University of Science and Technology	**Lecture languages** English
Study level second degree	**Mandatoriness** Elective
Study form full-time studies	**Block** Foreign languages
Education profile general academic profile	

Semesters	**Activities, hours, ECTS and examination**
Semester 1, Semester 2, Semester 3	• Classes: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Student has knowledge, skills and competences consistent with the requirements specified for the minimum B2 level according to the Common European Framework of Reference for Languages; knows, understands and uses linguistic means (grammatical, lexical and stylistic) from academic, specialist and technical languages used in the field of study and in the academic and professional environment; communicates in an intercultural and professional environment; understands and has the ability to analyze foreign-language specialist texts; improves their skills in the area of specialized and academic languages.	SJO_S2_U01

Program content ensuring learning outcomes

B2 plus English, French, Spanish, GermanC1 plus English languageGeneral educational content

Formation and deepening of communicative competence in academic and professional settings.
Interaction appropriate to the appropriate level of linguistic competence, such as the student's own profile for academic and professional purposes. Deepening creative, receptive and interactive competence in a team.
Language in communication in specialized and professional fields in the modern world. Verbal and non-verbal communication - functioning freely in an intercultural environment, conducting discourse, polemics, analysis of specialized texts.

Calculation of ECTS points

Activity form	**Activity hours**
Classes	30
Preparaton for classes	30
Student workload	**Hours** 60

Wrocław University of Science and Technology

Biomass and Biofuels in Energy Production

Educational subject description sheet

Basic information

Field of study Power Engineering **Speciality** Renewable Sources of Energy **Organizational unit** Faculty of Mechanical and Power Engineering **Study level** second degree 3 semesters **Study form** full-time studies **Education profile** general academic profile	**Education cycle** 2025/2026 **Subject code** **Lecture languages** English **Mandatoriness** Obligatory in specialty **Block** Specialty subjects **Subject related to scientific research** Yes

Semester	**Activities, hours, ECTS and examination**
Semester 2	• Lecture: 30 h, 2 ECTS, Exam • Laboratory: 15 h, 1 ECTS, Graded credit • Project: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Student compares combustion mechanisms and distinguishes technological systems for energy production, identifies biowaste management techniques.	K2_ENG_W05
PEU_W02	Student describes the classification of biomass and characterises its properties and analytical methods.	K2_ENG_W07
In terms of skills		
PEU_U01	Identify and characterise the main parameters and processes defining biofuels for the power energy sector.	K2_ENG_U07
PEU_U02	Perform balance calculations of devices or systems for the use of biomass, i.e. combustion and valorisation processes.	K2_ENG_U07

Program content ensuring learning outcomes

The classes introduce the extended classification of biomass, bio-waste and alternative fuels and their characteristics as fuels in industrial energy installations for the production of energy and heat. The classes determine familiarization with the technologies of energy production from biomass and biofuels. Practical examples of technology in the laboratory cover the characteristics of biofuels, and design exercise develop skills for the calculation of biomas utilisation devices or energy production systems.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	15
Project	15
Credit/Exam	4
Preparation for an exam/credit	16
Preparation of a project	10
Preparation of a report/summary/presentation/paper	10
Student workload	**Hours** 100

Wrocław University of Science and Technology

Modeling of Combustion Processes

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Computer Aided Mechanical and Power Engineering

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 15 h, 2 ECTS, Exam • Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Understand the physical and chemical aspects of combustion processes	K2_ENG_W03, K2_ENG_W07
PEU_W02	Understand chemical kinetics and chemistry of combustion. The role of elementary and global reactions. Reaction rate expressions	K2_ENG_W03
PEU_W03	Understand conversion formulas and thermochemical properties of the system. Heat of reaction and adiabatic flame temperature	K2_ENG_W03
PEU_W04	Understand chemical equilibrium and composition calculation	K2_ENG_W03
PEU_W05	Understand combustion modelling issues without transport. Ideal reactor studies	K2_ENG_W03
PEU_W06	Understand combustion modelling issues with transport. Reactive flow and transport phenomena. Turbulent combustion modelling	K2_ENG_W03

In terms of skills		
PEU_U01	Solve simple combustion problems by using the physical and chemical fundamentals of combustion processes.	K2_ENG_U06
PEU_U02	Calculate the stoichiometry, adiabatic flame temperature and heat of combustion of a fuel and oxidizer mixture.	K2_ENG_U06
PEU_U03	Use chemistry software to solve simple 0/1-d combustion problems such as perfectly stirred reactors	K2_ENG_U06

Program content ensuring learning outcomes

The subject provides an introduction to the subject of combustion process modeling, covering a broad range of topics important to the fields of energy conversion; to familiarize students with the basic aspects and equations describing the thermodynamics and gas dynamics in combustion process; to develop knowledge in mathematical description of processes occurring in combustion systems

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	30
Conducting literature research	10
Credit/Exam	4
Preparation for an exam/credit	10
Self-study of class topics	15
Preparation of a report/summary/presentation/paper	6
Preparation of a project	10
Student workload	**Hours** 100

Wrocław University of Science and Technology

Coolling Systems

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Refrigeration and Cryogenics

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 2 ECTS, Graded credit • Project: 15 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Demonstrates knowledge of rules and standards for designing and operating refrigeration systems and refrigeration facilities.	K2_ENG_W05
PEU_W02	Possesses knowledge of industrial, retail, and household refrigeration equipment, including refrigerated transport solutions.	K2_ENG_W05
PEU_W03	Exhibits expertise in the cooling of a variety of food products, including meat, vegetables, and beverages.	K2_ENG_W05
In terms of skills		
PEU_U01	Can select an appropriate cooling system for specific products or applications.	K2_ENG_U07
PEU_U02	Can calculate the required capacity for a refrigeration system, design the system, and choose its components.	K2_ENG_U07

Program content ensuring learning outcomes

This course introduces students to the regulations and standards governing the design and operation of refrigeration and cooling systems, covering system classification, functionality, and practical applications. It provides students with knowledge about system classification, their functioning, and practical uses. The course familiarizes students with safety regulations that influence system selection and operation, including the choice of working fluids. Additionally, it develops students' skills in designing efficient and reliable cooling and refrigeration systems.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Project	15
Preparation of a project	28
Self-study of class topics	25
Credit/Exam	2
Student workload	**Hours** 100

Wrocław University of Science and Technology

Solar Energy Conversion System

Educational subject description sheet

Basic information

Field of study Power Engineering **Speciality** Renewable Sources of Energy **Organizational unit** Faculty of Mechanical and Power Engineering **Study level** second degree 3 semesters **Study form** full-time studies **Education profile** general academic profile	**Education cycle** 2025/2026 **Subject code** **Lecture languages** English **Mandatoriness** Obligatory in specialty **Block** Specialty subjects **Subject related to scientific research** Yes

Semester	**Activities, hours, ECTS and examination**
Semester 2	• Lecture: 15 h, 1 ECTS, Exam • Laboratory: 15 h, 1 ECTS, Graded credit • Project: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of rules and standards for design and operation of solar energy conversion systems.	K2_ENG_W05
PEU_W02	Has knowledge of the design of solar energy conversion installations.	K2_ENG_W05
In terms of skills		
PEU_U01	Can determine the basic parameters of the solar collector and photovoltaic panel.	K2_ENG_U07
PEU_U02	Can conclude from the measurements of solar energy conversion systems operating parameters.	K2_ENG_U07
PEU_U03	Can calculate parameters related to solar radiation.	K2_ENG_U07

PEU_U04	Can design a liquid-based or air-based solar collector.	K2_ENG_U07

Program content ensuring learning outcomes

1, Acquisition of practical knowledge, regarding solar energy conversion systems, their design and application.
2. Development of skills how to design, measure and analyze solar energy conversion systems.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	15
Project	15
Preparaton for classes	8
Preparation of a project	10
Preparation of a report/summary/presentation/paper	8
Credit/Exam	4
Student workload	**Hours** 75

Wrocław University of Science and Technology

Advanced Numerical Modeling Using OpenFOAM

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Computer Aided Mechanical and Power Engineering

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 15 h, 1 ECTS, Graded credit • Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Knows and understands finite volume discretization and its specifics in the Computational Fluid Dynamics	K2_ENG_W01
PEU_W02	Knows and understands the structure of OpenFoam numerical toolbox and basics of OpenFoam programming	K2_ENG_W03
PEU_W03	Knows and understands advanced numerical models including: conjugate heat transfer, flow with mixing and complex boundary conditions	K2_ENG_W03
In terms of skills		
PEU_U01	Is able to use the basic and advanced preprocessing and postprocessing utilities offered by the OpenFoam environment	K2_ENG_U06
PEU_U02	Is able to implement new equations and to develop new solvers in OpenFoam	K2_ENG_U06

PEU_U03	Is able to define advanced numerical models including dynamic mesh multiphase flows and user defined boundary condition	K2_ENG_U05, K2_ENG_U06

Program content ensuring learning outcomes

Familiarization with professional free (Open Source) software for numerical modeling of momentum, mass, and energy transport—OpenFOAM. Gaining skills in formulating and implementing proprietary mathematical and numerical models.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	30
Credit/Exam	2
Self-study of class topics	13
Preparation of a report/summary/presentation/paper	15
Student workload	**Hours** 75

Wrocław University of Science and Technology

Applied Cryogenics in Power Engineering

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Refrigeration and Cryogenics

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student is able to list cryogenic factors and provide their basic physical properties.	K2_ENG_W05
PEU_W02	The student understands the phenomenon of superconductivity, is able to define and classify superconducting materials, indicate their basic properties and knows the limitations of their use	K2_ENG_W05
PEU_W03	The student is able to specify the use of liquefied gases in power engineering	K2_ENG_W05
PEU_W04	The student is able to indicate the application of superconducting devices in the power engineering.	K2_ENG_W05

Program content ensuring learning outcomes

Familiarizing students with the properties of liquefied gases,

Consolidating knowledge related to superconductivity, basic superconducting materials and their properties,
Transferring knowledge on the use of liquefied gases and superconducting devices in power engineering,
Indicating new trends in the development of power engineering based on the use of cryogenic temperatures and superconducting materials.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Conducting literature research	10
Preparation for an exam/credit	8
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Fuel Cells and Hydrogen Production

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Renewable Sources of Energy

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 2 ECTS, Graded credit • Laboratory: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student is able to describe the properties of hydrogen and list the basic technologies for its production and use in energy production processes and knows the methods of its storage.	K2_ENG_W05, K2_ENG_W07
PEU_W02	The student is able to describe the principle of operation of a fuel cell and knows the differences in the operation of different types of these devices.	K2_ENG_W05
In terms of skills		
PEU_U01	The student acquires skills related to hydrogen production and storage techniques.	K2_ENG_U07
PEU_U02	The student applies the measurement techniques learned to calculate the efficiency of production and work in devices using hydrogen. The student is able to design a technological system from hydrogen production to its use for energy production.	K2_ENG_U07

Program content ensuring learning outcomes

This subject will cover topics related to the use of hydrogen as an energy carrier, its physicochemical properties and the possibilities of storing and processing to obtain electrical energy. It will present various types of fuel cells that have found application in industry, as well as others that are currently on a laboratory scale.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	15
Preparaton for classes	13
Preparation of a report/summary/presentation/paper	8
Credit/Exam	2
Self-study of class topics	7
Student workload	**Hours** 75

Wrocław University of Science and Technology

Fundamentals of Programming

Educational subject description sheet

Basic information

Field of study Power Engineering **Speciality** Computer Aided Mechanical and Power Engineering **Organizational unit** Faculty of Mechanical and Power Engineering **Study level** second degree 3 semesters **Study form** full-time studies **Education profile** general academic profile	**Education cycle** 2025/2026 **Subject code** **Lecture languages** English **Mandatoriness** Obligatory in specialty **Block** Specialty subjects **Subject related to scientific research** Yes

Semester	**Activities, hours, ECTS and examination**
Semester 2	• Lecture: 15 h, 1 ECTS, Graded credit • Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	understands how the computer performs numerical calculations and knows principles of numerical programming	K2_ENG_W03
PEU_W02	knows the basic algorithms that solve typical computational tasks occurring when mathematical tools are applied to engineering problems	K2_ENG_W03
In terms of skills		
PEU_U01	can decide whether a given computational problem can be solved by computer; if so, is able to select the appropriate numerical algorithm as well as programming tools suitable for coding this algorithm; subsequently, is able to run correctly and efficiently the code and obtain the desired numerical results	K2_ENG_U06

Program content ensuring learning outcomes

After completing the course one can use a selected programming environment and use it in order to obtain a numerical code and implement selected calculation algorithms. The course provide the knowledge about how to reach selected calculation goals met typically while using mathematical tools in engineer practice, especially during numerical modelling of physical phenomena, such as heat flow or fluid flow. The course provide practical skills leading from identifying a computational problem through selection of algorithms and programming tools, creating code, running the program, up to verifying the correctness and accuracy of the numerical results obtained.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	30
Preparation of a project	20
Preparaton for classes	3
Self-development of practical skills	3
Preparation of a report/summary/presentation/paper	2
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Air Conditioning Systems

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Refrigeration and Cryogenics

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 15 h, 1 ECTS, Graded credit • Laboratory: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of rules and standards for design and operation of air-condition systems	K2_ENG_W03
PEU_W02	Has knowledge of the design of air-conditioning installations	K2_ENG_W03
In terms of skills		
PEU_U01	Can determine the basic parameters of the air-conditioning system and indicate characteristic points of refrigeration cycle	K2_ENG_U07
PEU_U02	Can conclude from the measurements of air-conditioning system operating parameters	K2_ENG_U07

Program content ensuring learning outcomes

Acquisition of practical knowledge of air conditioning and air distribution systems, their design and application, discussion of air conditioning processes and ventilation and air distribution systems, heat recovery and the construction of heat exchangers in air conditioning. Designing ventilation ducts, learning about methods of connecting pipes in air conditioning systems, developing skills in designing and analyzing the operation of air conditioning systems.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	15
Preparaton for classes	6
Preparation of a report/summary/presentation/paper	8
Preparation for an exam/credit	4
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Water Power Engineering

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Renewable Sources of Energy

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 15 h, 1 ECTS, Graded credit • Laboratory: 15 h, 1 ECTS, Graded credit • Project: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Understands the concepts of water management and the potential for utilizing water energy.	K2_ENG_W05
PEU_W02	Has knowledge of how to select turbine types, determine their number, arrangement, and associated generators. Understands key concepts such as installed parameters, draft tube, half-spiral, and open chambe	K2_ENG_W05, K2_ENG_W08
PEU_W03	Has knowledge of the calculations and operations of different types of hydro power plants.	K2_ENG_W05, K2_ENG_W08
In terms of skills		
PEU_U01	The student is able to conduct an investigation of water turbines.	K2_ENG_U07

PEU_U02	The student is able to assess the hydro potential of a river and select installation parameters for an HPP.	K2_ENG_U07
PEU_U03	The student is able to calculate the energy potential for different types of HPPs.	K2_ENG_U07, K2_ENG_U08
PEU_U04	The student is able to select turbines based on peak performance characteristics.	K2_ENG_U08

Program content ensuring learning outcomes

1. Students will learn various methods of harnessing water resources for renewable energy purposes, which will include the process of energy accumulation.
2. To provide students with the importance of hydropower for the electricity system, ecology and economy.
3. Students will learn the types and principles of operation of water turbines.
4. To provide students with the construction of hydroelectric power.
5. Developing skills identification and assessment of water energy resources.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	15
Project	15
Credit/Exam	2
Preparation for an exam/credit	9
Preparation of a project	7
Preparaton for classes	5
Preparation of a report/summary/presentation/paper	7
Student workload	**Hours** 75

Wrocław University of Science and Technology

Advanced Data Processing

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Computer Aided Mechanical and Power Engineering

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 15 h, 1 ECTS, Graded credit • Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Knowledge of programming in simulation conditions	K2_ENG_W03
PEU_W02	Knowledge of programming in real conditions	K2_ENG_W03
PEU_W03	Knowledge of selecting and using appropriate measurement systems	K2_ENG_W03
In terms of skills		
PEU_U01	Ability to program in LabView™	K2_ENG_U06
PEU_U02	Ability to connect the appliance in practice	K2_ENG_U06
PEU_U03	Ability to model and verify a mathematical model	K2_ENG_U06

Program content ensuring learning outcomes

1. Provide knowledge on how to conduct automated measurement methods.
2. Provide knowledge of methods for analysing measurement data.
3. Providing knowledge on the verification of mathematical models.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	30
Preparaton for classes	6
Preparation of a report/summary/presentation/paper	10
Self-study of class topics	6
Preparation for an exam/credit	6
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Vapor-Compression Refrigeration Systems

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Refrigeration and Cryogenics

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 2 ECTS, Exam • Laboratory: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	knows the basics of cooling system implementation and the differences between theoretical and actual cooling system.	K2_ENG_W05
PEU_W02	have knowledge of the design of refrigeration compressor installations	K2_ENG_W05
PEU_W03	knows the mathematical model describing heat exchangers and principles of fitting selection	K2_ENG_W05
In terms of skills		
PEU_U01	can determine the basic parameters of the refrigeration cycle and indicate the differences between the theoretical and actual refrigeration cycle.	K2_ENG_U07
PEU_U02	can conclude from the measurements of refrigeration plant operating parameters	K2_ENG_U07

Program content ensuring learning outcomes

The lecture allows the student to learn the principles of designing compressors for refrigeration systems. The laboratory is intended to familiarize the student with the operation of a refrigeration system, measurements of basic operating parameters and interpretation of research results.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	15
Credit/Exam	4
Preparation of a report/summary/presentation/paper	13
Preparation for an exam/credit	13
Student workload	**Hours** 75

Wrocław University of Science and Technology

Wind Power Plants

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Renewable Sources of Energy

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 15 h, 1 ECTS, Graded credit • Project: 15 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Describes the principles of operation and the construction of various types of wind power plants.	K2_ENG_W05
PEU_W02	Explains the principles of selecting the optimal location for wind turbines based on weather conditions and terrain topography.	K2_ENG_W05
PEU_W03	Presents and defines the main results of momentum theory and blade element theory.	K2_ENG_W05
In terms of skills		
PEU_U01	Calculates the power curve of a wind turbine using the Blade Element Method and determines the annual electricity production of the wind turbine.	K2_ENG_U08
PEU_U02	Uses QBlade software for the aerodynamic design of wind turbines and selects the optimal location for the designed wind turbine.	K2_ENG_U08

Program content ensuring learning outcomes

Familiarization with the principles of operation and construction of wind power plants. Introduction to issues related to wind characteristics and the impact of terrain topography on wind turbine performance.
Discussion of fundamental theories of wind turbine operation and aerodynamic aspects.
Introduction to economic and environmental issues related to wind energy.
Discussion of topics related to wind farm operation and the optimal placement of wind turbines.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Project	15
Credit/Exam	2
Preparation of a project	15
Preparaton for classes	6
Preparation for an exam/credit	10
Self-study of class topics	12
Student workload	**Hours** 75

Wrocław University of Science and Technology

Numerical Methods

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Computer Aided Mechanical and Power Engineering

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 15 h, 1 ECTS, Exam • Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Understanding the numerical calculations proces based on a finite digit representation and accuracy related problems.	K2_ENG_W03
PEU_W02	Understanding the concept of numerical interpolation and ability to construct interpolation polynomials and spline functions. Ability to estimate the interpolation error.	K2_ENG_W03
PEU_W03	Knowledge of data processing with least square approximation method for any set of basis functions.	K2_ENG_W01, K2_ENG_W03
PEU_W04	Knowledge of numerical integration and differentation methods. Knowledge of error source and methods of its estimation.	K2_ENG_W01, K2_ENG_W03
PEU_W05	Knowledge of methods for solving non-linear equations and systems of linear equations.	K2_ENG_W01, K2_ENG_W03
In terms of skills		

PEU_U01	Use of MATLAB/Octave built in functions and basic programming operations. Creating plots and user defined functions.	K2_ENG_U06
PEU_U02	For a given set of points student know how to find an interpolating polynomial or create spline function	K2_ENG_U06
PEU_U03	Student is able to determine the integral value with use of Midpoint, Trapezoid or Simpson method. Based on finite-difference method student is able to determine the value of the derivative.	K2_ENG_U05, K2_ENG_U06
PEU_U04	With the use of Bisection, Secants, Newton or Fixed-Point method, student can solve non-linear equation	K2_ENG_U05, K2_ENG_U06
PEU_U05	Solving a system of linear algebraic equations using an algorithm implemented in MATALB	K2_ENG_U05, K2_ENG_U06

Program content ensuring learning outcomes

Acquisition of basic numerical methods knowledge essential for solving engineering problems. Improving the state of knowledge in the field of computer-based calculations.
Obtaining skill of creating programs utilizing basic algorithms of numerical methods with use of approximation, interpolation, numerical integration and differentation, solving nonlinear algebraic equations and differential equations.
Developing the ability to use the selected numerical techniques to process measurement data and solve real-life engineering problems.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	30
Preparaton for classes	6
Preparation of a report/summary/presentation/paper	10
Preparation for an exam/credit	5
Self-development of practical skills	5
Credit/Exam	4
Student workload	**Hours** 75

Wrocław University of Science and Technology

Cryogenics

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Refrigeration and Cryogenics

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 2 ECTS, Exam • Laboratory: 30 h, 2 ECTS, Graded credit • Project: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Knows definition, terminology and applications of cryogenics	K2_ENG_W05
PEU_W02	Knows the processes of obtaining low temperatures in fluids and solids	K2_ENG_W05
PEU_W03	Knows the principle of operation and flow diagrams of cryogenic refrigerators and liquefies	K2_ENG_W05
PEU_W04	Knows basic methods of reaching the ultra low temperatures (below 1 K)	K2_ENG_W05
PEU_W05	Knows the methods of gas mixtures separation (including air)	K2_ENG_W05
In terms of skills		

PEU_U01	The ability to define the cooling or cryostating problem of a given object	K2_ENG_U07, K2_ENG_U08
PEU_U02	The ability to calculate a energy balance of cryogenic refrigerators	K2_ENG_U08
PEU_U03	The ability to depict processes of cryogenic refrigerators and liquefies	K2_ENG_U07, K2_ENG_U08
PEU_U04	The ability to perform low temperature measurements	K2_ENG_U07

Program content ensuring learning outcomes

Familiarizing students with the physical basics of cryogenics.
Familiarizing them with the structure and operation of cryogenic devices.
Providing practical knowledge in the safe handling of cryogenic liquids.
Developing skills in conducting measurements at low temperatures and analyzing data.
Developing skills in the calculation of cryogenic cycles and heat exchange.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Project	15
Preparation for an exam/credit	8
Preparation of a project	15
Preparation of a report/summary/presentation/paper	15
Preparaton for classes	8
Credit/Exam	4
Student workload	**Hours** 125

Wrocław University of Science and Technology

CFD Simulations of Power Generation Units

Educational subject description sheet

Basic information

Field of study Power Engineering **Speciality** - **Organizational unit** Faculty of Mechanical and Power Engineering **Study level** second degree 3 semesters **Study form** full-time studies **Education profile** general academic profile	**Education cycle** 2025/2026 **Subject code** **Lecture languages** English **Mandatoriness** Obligatory **Block** Major-specific subjects **Subject related to scientific research** Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 3 ECTS, Exam • Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of the equations describing steady-state and transient heat transfer and fluid flow and numerical methods for solving heat transfer problems	K2_ENG_W01, K2_ENG_W03
PEU_W02	He/she is familiar with the implementation of turbulence models also in, among other things, thermal-flow optimisation	K2_ENG_W01, K2_ENG_W03, K2_ENG_W04
In terms of skills		
PEU_U01	Has the ability to create numerical geometry and meshing, assessing the impact of mesh density on numerical results	K2_ENG_U06
PEU_U02	Be able to perform numerical calculations of steady and transient heat and fluid flow	K2_ENG_U05, K2_ENG_U06

PEU_U03	Has the ability to analyse numerical results and draw appropriate conclusions	K2_ENG_U05, K2_ENG_U06

Program content ensuring learning outcomes

1. Providing knowledge about methods of thermal-flow processes numerical simulations
2. Providing knowledge about energetic systems optimizing methods
3. Developing skills of creating mesh for defined geometry
4. Developing abilities of performing numerical calculations for simple and complex thermal-flow processes

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Laboratory	30
Preparaton for classes	10
Credit/Exam	4
Preparation for an exam/credit	12
Preparation of a report/summary/presentation/paper	18
Self-study of class topics	10
Conducting literature research	5
Self-development of practical skills	6
Student workload	**Hours** 125

Wrocław University of Science and Technology

Modeling of Energy Systems

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
-

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory

Block
Major-specific subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 15 h, 1 ECTS, Graded credit • Laboratory: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Identifies the fundamentals and laws governing conversion of energy	K2_ENG_W01
PEU_W02	Formulates the analysis of cogeneration, combined and integrated cycles for conventional and advanced technologies	K2_ENG_W01, K2_ENG_W03
PEU_W03	Define mathematical model to assess particular energy system	K2_ENG_W01, K2_ENG_W03
In terms of skills		
PEU_U01	Solves engineering calculations of energy systems.	K2_ENG_U05, K2_ENG_U06
PEU_U02	Implements mathematical model to assess particular energy system	K2_ENG_U06

Program content ensuring learning outcomes

1 Demonstrate an understanding of the fundamentals and laws governing energy conversion
2 Discuss issues related to the performance of conventional power-generation plants.
3 Present trends toward renewable sources of electricity.
4 A study of steam generation and utility plants, including cogeneration, gas turbine, and combined cycles
5 Demonstrate features of advanced power plants
6 Perform engineering calculations.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	30
Credit/Exam	2
Preparaton for classes	8
Preparation for an exam/credit	8
Self-development of practical skills	6
Preparation of a report/summary/presentation/paper	6
Student workload	**Hours** 75

Wrocław University of Science and Technology

Project Management at Energy Sector

Educational subject description sheet

Basic information

Field of study Power Engineering **Speciality** - **Organizational unit** Faculty of Mechanical and Power Engineering **Study level** second degree 3 semesters **Study form** full-time studies **Education profile** general academic profile	**Education cycle** 2025/2026 **Subject code** **Lecture languages** English **Mandatoriness** Elective **Block** Subjects from the fields of humanities or social sciences

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of projects, knows the mine components of the project and knows how to manage them.	K2_ENG_W09
PEU_W02	Knows and understands the conditions related to the implementation of projects in the energy sector	K2_ENG_W09
In terms of social competences		
PEU_K01	He is ready to think and act in a creative and entrepreneurial way in a project team	K2_ENG_K03, K2_ENG_K04

Program content ensuring learning outcomes

The course aims to provide students with knowledge of project management, with a particular focus on the specifics of the energy sector. It covers management methodologies, planning, scheduling, risk analysis, as well as financial and regulatory aspects of energy project execution. Students will learn the tools and techniques necessary for effective project

management in this industry, considering technological innovations and sustainable development.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Self-study of class topics	28
Preparaton for classes	6
Preparation for an exam/credit	9
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Team Management

Educational subject description sheet

Basic information

Field of study Power Engineering **Speciality** - **Organizational unit** Faculty of Mechanical and Power Engineering **Study level** second degree 3 semesters **Study form** full-time studies **Education profile** general academic profile	**Education cycle** 2025/2026 **Subject code** **Lecture languages** English **Mandatoriness** Elective **Block** Subjects from the fields of humanities or social sciences

Semester	Activities, hours, ECTS and examination
Semester 2	• Lecture: 30 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Explains the importance of different group roles in team work, including the special role of the leader.	K2_ENG_W09
PEU_W02	Identifies the processes that determine the functioning of individuals in groups and teams.	K2_ENG_W09
In terms of social competences		
PEU_K01	He/She is responsible for the development of knowledge and social competences in his professional and managerial activities.	K2_ENG_K03
PEU_K02	In his/her teamwork and when solving group problems he/she is open and creative.	K2_ENG_K04

Program content ensuring learning outcomes

The lecture provides students with knowledge of the functioning of teams - both in the social, organizational and professional context. Theories and models from the area of social psychology, management and communication will be presented to the audience. Knowledge of social perception processes, using categories and cognitive patterns, cognitive and memory processes, decision-making and group dynamics constitutes the basis for effective action in the role of team leaders, but also in other group roles. An important element of the course will also be presenting contemporary assumptions, methods and tools of team management, taking into account the diverse needs of their members, including analyzing intergenerational differences, but also individual (personality and other) differences.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Self-study of class topics	10
Preparation for an exam/credit	18
Preparation of a report/summary/presentation/paper	15
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Foreign Language 2.2

Educational subject description sheet

Basic information

Field of study lektoraty	**Education cycle** 2025/2026
Speciality -	**Subject code** SJO000-25SM02690C
Organizational unit Wrocław University of Science and Technology	**Lecture languages** English
Study level second degree	**Mandatoriness** Elective
Study form full-time studies	**Block** Foreign languages
Education profile general academic profile	

Semesters	**Activities, hours, ECTS and examination**
Semester 1, Semester 2, Semester 3	• Classes: 60 h, 3 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	Student has knowledge, skills and competences consistent with the requirements specified for the appropriate language level; knows, understands and uses linguistic means (grammatical, lexical and stylistic) defined at a certain level from everyday life with selected elements of academic, specialist and technical language used in the field of study and in the academic and professional environment; communicates in a family, social and intercultural environment, practicing communication skills; appreciates the need to improve their skills in effective communication, develops competences in the area of communication language, basics of specialist and academic language	SJO_S2_U01

Program content ensuring learning outcomes

A1; A2; B1 French, Spanish, Japanese, German, Polish as a foreign language, Russian
General educational content
Formation and deepening of communicative competence in a family, social and intercultural environment and for a specific level for academic and professional needs.
Interaction appropriate to the appropriate level of language competence, e.g., the student's own profile and interests; presenting oneself, one's interests and ideas in environmental, academic and professional contexts. Developing creative, receptive and interactive competence in a group.
Language in communication in the modern world. Verbal and non-verbal communication - sensitivity to cultural differences, starting a conversation, joining in a discussion, moving on to the next points, summarizing statements, using characteristic phrases and expressions for a certain language level; taking part in various forms of interaction.

Calculation of ECTS points

Activity form	**Activity hours**
Classes	60
Preparaton for classes	30
Student workload	**Hours** 90

Wrocław University of Science and Technology

Geothermal Power Engineering

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Renewable Sources of Energy

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit • Classes: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Classifies and characterizes geothermal systems.	K2_ENG_W05
PEU_W02	Characterizes and explains key aspects related to the exploration, development, and utilization of geothermal resources.	K2_ENG_W05
In terms of skills		
PEU_U01	Analyzes and independently solves engineering problems related to geothermal energy.	K2_ENG_U09

Program content ensuring learning outcomes

The lecture will cover key aspects of geothermal energy, including the model of a geothermal system, as well as the classification and characterization of geothermal resources. Strategies and techniques for exploring geothermal sources, along with methods of utilizing geothermal energy, will also be presented. During exercises, students will develop the ability

to analyze and independently solve engineering problems related to geothermal energy.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Classes	15
Preparaton for classes	2
Self-study of class topics	4
Self-development of practical skills	4
Preparation for an exam/credit	6
Credit/Exam	4
Student workload	**Hours** 50

Wrocław University of Science and Technology

Cold Chain

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Refrigeration and Cryogenics

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Student is able to choose the right refrigeration technology depending on the individual requirements of the stored goods	K2_ENG_W07
PEU_W02	Student is able to calculate the needed cooling capacity depending of the individual requirements of the stored goods or processes.	K2_ENG_W07

Program content ensuring learning outcomes

The scope of the lecture includes: Basic thermal processes and their effect on organic materials, Cooling processes and characteristics of the most important accompanying processes. Description of the air cooling environment and the basics of cooling theory. Food freezing theory

Calculation of ECTS points

Activity form	Activity hours
Lecture	15
Preparaton for classes	8
Credit/Exam	2
Student workload	**Hours** 25

Wrocław University of Science and Technology

Artificial Intelligence

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Computer Aided Mechanical and Power Engineering

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit • Laboratory: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Student defines the principles of operation of artificial neural networks.	K2_ENG_W05
PEU_W02	Student knows and understands how genetic algorithm works	K2_ENG_W05
PEU_W03	Student explains how fuzzy logic works	K2_ENG_W05
In terms of skills		
PEU_U01	Student uses the basic features offered by the MATLAB/Excel/Pascal software, use its graphics capabilities and write simple computational programs	K2_ENG_U06
PEU_U02	Student uses an analytical approach to solve real life problems using artificial neural networks, genetic algorithms, fuzzy logic	K2_ENG_U06

Program content ensuring learning outcomes

Providing of the basic knowledge, taking into account its application aspects, in the field of artificial intelligence.
Understanding the basic algorithms of neural networks learning, genetic algorithms and fuzzy logic.
Developing abilities in using of the gained knowledge for solving simple engineering problems. Developing skills related to MATLAB, EXCEL, PASCAL software to solve simple engineering problems.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	15
Preparation of a report/summary/presentation/paper	18
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Thermonuclear Power Generation

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Renewable Sources of Energy

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit • Seminar: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student characterizes the main nuclear fusion technologies.	K2_ENG_W05
PEU_W02	The student analyzes and illustrates the potential of using nuclear fusion in the energy sector.	K2_ENG_W05
In terms of skills		
PEU_U01	The student presents selected issues related to the topic of nuclear fusion	K2_ENG_U04

Program content ensuring learning outcomes

Presentation of nuclear physics and nuclear fusion topics related to thermonuclear energy. Discussion of selected technologies for controlling and maintaining plasma, with particular emphasis on tokamaks and stellarators. Review of major nuclear fusion experiments and their results, especially in the context of thermonuclear energy.

Calculation of ECTS points

Activity form	Activity hours
Lecture	15
Seminar	15
Credit/Exam	2
Self-study of class topics	8
Preparation of a report/summary/presentation/paper	10
Student workload	**Hours** 50

Wrocław University of Science and Technology

Cryogenic Systems and Applied Superconductivity

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Refrigeration and Cryogenics

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 30 h, 2 ECTS, Graded credit • Project: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Knows definition of the superconductivity and its applications in industry, energy, medicine and science.	K2_ENG_W07
PEU_W02	Knows the properties of selected low- and high-temperature superconductors, their production technologies and cryostabilization methods	K2_ENG_W07
PEU_W03	Know the design of cryogenic systems and devices as well as their individual components.	K2_ENG_W07
In terms of skills		
PEU_U01	Is able to design cryogenic devices and systems as well as selecting and sizing their individual components.	K2_ENG_U08
PEU_U02	Is able to select and size individual components of cryogenic systems and devices.	K2_ENG_U08

PEU_U03	Is able to classify superconducting devices depending on application needs	K2_ENG_U08

Program content ensuring learning outcomes

Acquiring knowledge of superconductivity and its applications in industry, energy, medicine and science.
Getting to know the properties of selected low- and high-temperature superconductors, their production technologies and cryostabilization methods.
Acquiring knowledge of the design of cryogenic systems and devices as well as skills in the selection and dimensioning of their individual components.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	30
Project	15
Preparation for an exam/credit	8
Preparation of a project	15
Conducting literature research	5
Credit/Exam	2
Student workload	**Hours** 75

Wrocław University of Science and Technology

Thermodynamic Analysis of Energy Processes

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Computer Aided Mechanical and Power Engineering

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit • Classes: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Familiar with the methods of optimizing energy processes and devices.	K2_ENG_W04
PEU_W02	Knows the principles of the exergy and entropy analysis of energy processes.	K2_ENG_W04
In terms of skills		
PEU_U01	Can perform the entropy and exergy balance of different systems.	K2_ENG_U06
PEU_U02	Can perform the basic optimization of energy devices and processes.	K2_ENG_U06

Program content ensuring learning outcomes

To familiarize students with the tools to optimize energy processes.
To acquaint students with the methods of calculating exergy and entropy.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Classes	15
Credit/Exam	4
Preparaton for classes	10
Self-development of practical skills	6
Student workload	**Hours** 50

Wrocław University of Science and Technology

Heat Pumps

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Renewable Sources of Energy

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit • Project: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Has knowledge of rules and standards for design and operation of heat pumps.	K2_ENG_W05, K2_ENG_W07
PEU_W02	Knows the classification of heat pump system.	K2_ENG_W05
In terms of skills		
PEU_U01	Can choose the proper cycle for a given heat pump system.	K2_ENG_U08
PEU_U02	Can calculate the capacity of the heat pump system and can design a heat pump system.	K2_ENG_U08

Program content ensuring learning outcomes

1. Teaching of practical knowledge, regarding heat pump technology, their design and application.

2. Teaching of skills how to design and analyze heat pumps, their behavior and consequences of its cooperation with various heat sources.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Project	15
Preparaton for classes	8
Preparation of a project	10
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Sorption Refrigeration

Educational subject description sheet

Basic information

Field of study Power Engineering **Speciality** Refrigeration and Cryogenics **Organizational unit** Faculty of Mechanical and Power Engineering **Study level** second degree 3 semesters **Study form** full-time studies **Education profile** general academic profile	**Education cycle** 2025/2026 **Subject code** **Lecture languages** English **Mandatoriness** Obligatory in specialty **Block** Specialty subjects **Subject related to scientific research** Yes

Semester	**Activities, hours, ECTS and examination**
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit • Classes: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Student defines the construction and operation of sorption energy systems and the properties of working solutions	K2_ENG_W08
PEU_W02	Student distinguishes structured knowledge of process energy balancing and thermal calculation of sorption apparatuses of energy systems	K2_ENG_W05
In terms of skills		
PEU_U01	Student calculates and balance sorption circuit processes of energy systems.	K2_ENG_U09
PEU_U02	Student calculates and selects apparatuses of sorption energy systems.	K2_ENG_U09

Program content ensuring learning outcomes

The lecture covers the basic concepts and definitions from the thermodynamics of solutions necessary for modeling absorption cycles, including the principles of operation of absorption equipment. It discusses the properties of working vapors and their influence on system design, and the construction of h-ksi diagrams for aqueous ammonia solutions and h-ksi and lgp-t diagrams for aqueous lithium bromide solutions. The application of thermodynamic balancing principles to model sorption cycles includes thermal and substance balances of partial processes, with specific focus on ammonia and lithium bromide systems. The course also addresses the principles of operation and thermal and hydraulic calculations of absorbers, desorbers, and rectifiers in water-ammonia and water-lithium bromide sorption systems, along with adsorption and desorption processes in refrigeration systems and their working pairs. For calculus classes, the focus is on analyzing potential heat sources, calculating primary energy demand and environmental impact, heat recovery in industrial plants, balancing absorption apparatuses in NH3-H2O and LiBr-H2O chillers, heat transfer in these solutions, and comprehensive calculations of sorption systems

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Classes	15
Credit/Exam	4
Preparaton for classes	10
Self-development of practical skills	3
Preparation for an exam/credit	3
Student workload	**Hours** 50

Wrocław University of Science and Technology

Integrated Production Systems

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Computer Aided Mechanical and Power Engineering

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 1 ECTS, Graded credit • Laboratory: 15 h, 1 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Knows the basic production processes and the principles of their integration within the enterprise IT platform.	K2_ENG_W08
PEU_W02	Has basic knowledge of CAD, CAE, CAPP, CAM.	K2_ENG_W08
PEU_W03	Knows the methods of rapid prototyping and reverse engineering.	K2_ENG_W08
In terms of skills		
PEU_U01	Is able to elaborate a complete machine part design in one integrated CATIA package from the concept stage to simulation of the manufacturing process using MES and CAM.	K2_ENG_U08
PEU_U02	Is able to use online knowledge resources to select and obtain models of machine parts and is able to prepare a coherent presentation regarding the implemented project.	K2_ENG_U08

Program content ensuring learning outcomes

During the course, students will be introduced to such issues as: basic manufacturing techniques, basics of CAD systems, basics of FEM and CFD calculations, basics of CNC machine programming and CAM technology, principles of reverse engineering and rapid prototyping technologies. The above issues make up what is known as CIM (Computer Integrated Manufacturing).

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Laboratory	15
Credit/Exam	2
Preparation of a project	14
Preparation for an exam/credit	4
Student workload	**Hours** 50

Wrocław University of Science and Technology

Master Thesis

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Renewable Sources of Energy

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Diploma thesis

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Diploma thesis: 60 h, 20 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	The student is able to select and verify information useful for understanding a specific topic, synthesize and critically analyze collected data from various sources, and effectively utilize it while writing the master's thesis.	K2_ENG_U01
PEU_U02	The student is able to conduct experimental research, carry out design work, or develop software (optionally), analyze results, draw conclusions from their findings, and prepare a written report on a selected scientific or practical topic.	K2_ENG_U02, K2_ENG_U03
In terms of social competences		
PEU_K01	The student understands the importance of accurately processing research results, is open to the need for improving their professional, personal, and social competencies, and is aware of their responsibility for the work performed and the respect for copyright.	K2_ENG_K01, K2_ENG_K02, K2_ENG_K03, K2_ENG_K05

Program content ensuring learning outcomes

As part of the course, the student prepares a master's thesis, which involves independently solving an engineering problem within the scope of general and specialized knowledge acquired in the given field and level of study. The student enhances their ability to select and analyze sources of knowledge, including scientific literature, technical documents, and other sources, while considering their reliability and relevance. The objective and detailed scope of the thesis are defined by the supervisor in the Submission of the thesis topic (in the APD system).

Calculation of ECTS points

Activity form	**Activity hours**
Diploma thesis	60
Conducting literature research	10
Preparation of the thesis	390
Praca z opiekunem nad częścią merytoryczną pracy	40
Student workload	**Hours** 500

Wrocław University of Science and Technology

Master Thesis

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Refrigeration and Cryogenics

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Diploma thesis

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Diploma thesis: 60 h, 20 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	The student is able to select and verify information useful for understanding a specific topic, synthesize and critically analyze collected data from various sources, and effectively utilize it while writing the master's thesis.	K2_ENG_U01
PEU_U02	The student is able to conduct experimental research, carry out design work, or develop software (optionally), analyze results, draw conclusions from their findings, and prepare a written report on a selected scientific or practical topic.	K2_ENG_U02, K2_ENG_U03
In terms of social competences		
PEU_K01	The student understands the importance of accurately processing research results, is open to the need for improving their professional, personal, and social competencies, and is aware of their responsibility for the work performed and the respect for copyright.	K2_ENG_K01, K2_ENG_K02, K2_ENG_K03, K2_ENG_K05

Program content ensuring learning outcomes

As part of the course, the student prepares a master's thesis, which involves independently solving an engineering problem within the scope of general and specialized knowledge acquired in the given field and level of study. The student enhances their ability to select and analyze sources of knowledge, including scientific literature, technical documents, and other sources, while considering their reliability and relevance. The objective and detailed scope of the thesis are defined by the supervisor in the Submission of the thesis topic (in the APD system).

Calculation of ECTS points

Activity form	**Activity hours**
Diploma thesis	60
Conducting literature research	10
Preparation of the thesis	390
Praca z opiekunem nad częścią merytoryczną pracy	40
Student workload	**Hours** 500

Wrocław University of Science and Technology

Master Thesis

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Computer Aided Mechanical and Power Engineering

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Diploma thesis

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Diploma thesis: 60 h, 20 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	The student is able to select and verify information useful for understanding a specific topic, synthesize and critically analyze collected data from various sources, and effectively utilize it while writing the master's thesis.	K2_ENG_U01
PEU_U02	The student is able to conduct experimental research, carry out design work, or develop software (optionally), analyze results, draw conclusions from their findings, and prepare a written report on a selected scientific or practical topic.	K2_ENG_U02, K2_ENG_U03
In terms of social competences		
PEU_K01	The student understands the importance of accurately processing research results, is open to the need for improving their professional, personal, and social competencies, and is aware of their responsibility for the work performed and the respect for copyright.	K2_ENG_K01, K2_ENG_K02, K2_ENG_K03, K2_ENG_K05

Program content ensuring learning outcomes

As part of the course, the student prepares a master's thesis, which involves independently solving an engineering problem within the scope of general and specialized knowledge acquired in the given field and level of study. The student enhances their ability to select and analyze sources of knowledge, including scientific literature, technical documents, and other sources, while considering their reliability and relevance. The objective and detailed scope of the thesis are defined by the supervisor in the Submission of the thesis topic (in the APD system).

Calculation of ECTS points

Activity form	**Activity hours**
Diploma thesis	60
Conducting literature research	10
Preparation of the thesis	390
Praca z opiekunem nad częścią merytoryczną pracy	40
Student workload	**Hours** 500

Wrocław University of Science and Technology

Master Seminar

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Renewable Sources of Energy

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Seminar: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	The student is able to gather, interpret, and use information from various sources necessary to complete a specific experimental, design, or study-analytical task.	K2_ENG_U01
PEU_U02	The student is able to prepare a coherent report or presentation on the work carried out, including the results of the proposed design, technological, or operational solutions.	K2_ENG_U01, K2_ENG_U03, K2_ENG_U04
PEU_U03	The student is able to objectively justify the purpose of their original ideas and solutions during discussions and critically assess technical solutions proposed by others.	K2_ENG_U02, K2_ENG_U04
In terms of social competences		
PEU_K01	The student understands the need to enhance their professional and personal competencies and is aware of the social consequences of engineering activities.	K2_ENG_K01, K2_ENG_K05

PEU_K02	The student is able to collaborate and behave appropriately in a group, actively participate in professional discussions while maintaining respect for differing opinions and adhering to proper communication etiquette.	K2_ENG_K03
PEU_K03	The student is able to think and act in a creative and entrepreneurial way, and is capable of defining priorities that determine the success of a planned task.	K2_ENG_K01, K2_ENG_K03

Program content ensuring learning outcomes

Presentation of the requirements that a master's thesis must meet.
Presentation of the general principles of the diploma examination process.
Student presentations regarding the current state of knowledge in the area of their diploma theses. Improving the skills of searching for selective knowledge necessary to create original concepts and solutions, as well as preparing presentations that allow them to communicate these ideas effectively to others. Enhancing the skills of creative discussion, where proposed solutions or ideas can be justified in a factual and substantive manner.
Student presentations regarding achievements in their diploma theses. Improving the skills of writing a work on a specific topic, showcasing one's own achievements in the context of existing known solutions. Developing a sense of diligence and responsibility for the commitments made, both to oneself and to others.

Calculation of ECTS points

Activity form	**Activity hours**
Seminar	30
Preparation of a report/summary/presentation/paper	20
Student workload	**Hours** 50

Wrocław University of Science and Technology

Master Seminar

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Refrigeration and Cryogenics

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Seminar: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	The student is able to gather, interpret, and use information from various sources necessary to complete a specific experimental, design, or study-analytical task.	K2_ENG_U01
PEU_U02	The student is able to prepare a coherent report or presentation on the work carried out, including the results of the proposed design, technological, or operational solutions.	K2_ENG_U01, K2_ENG_U03, K2_ENG_U04
PEU_U03	The student is able to objectively justify the purpose of their original ideas and solutions during discussions and critically assess technical solutions proposed by others.	K2_ENG_U02, K2_ENG_U04
In terms of social competences		
PEU_K01	The student understands the need to enhance their professional and personal competencies and is aware of the social consequences of engineering activities.	K2_ENG_K01, K2_ENG_K05

PEU_K02	The student is able to collaborate and behave appropriately in a group, actively participate in professional discussions while maintaining respect for differing opinions and adhering to proper communication etiquette.	K2_ENG_K03
PEU_K03	The student is able to think and act in a creative and entrepreneurial way, and is capable of defining priorities that determine the success of a planned task.	K2_ENG_K01, K2_ENG_K03

Program content ensuring learning outcomes

Presentation of the requirements that a master's thesis must meet.
Presentation of the general principles of the diploma examination process.
Student presentations regarding the current state of knowledge in the area of their diploma theses. Improving the skills of searching for selective knowledge necessary to create original concepts and solutions, as well as preparing presentations that allow them to communicate these ideas effectively to others. Enhancing the skills of creative discussion, where proposed solutions or ideas can be justified in a factual and substantive manner.
Student presentations regarding achievements in their diploma theses. Improving the skills of writing a work on a specific topic, showcasing one's own achievements in the context of existing known solutions. Developing a sense of diligence and responsibility for the commitments made, both to oneself and to others.

Calculation of ECTS points

Activity form	**Activity hours**
Seminar	30
Preparation of a report/summary/presentation/paper	20
Student workload	**Hours** 50

Wrocław University of Science and Technology

Master Seminar

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
Computer Aided Mechanical and Power Engineering

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Obligatory in specialty

Block
Specialty subjects

Subject related to scientific research
Yes

Semester	Activities, hours, ECTS and examination
Semester 3	• Seminar: 30 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of skills		
PEU_U01	The student is able to gather, interpret, and use information from various sources necessary to complete a specific experimental, design, or study-analytical task.	K2_ENG_U01
PEU_U02	The student is able to prepare a coherent report or presentation on the work carried out, including the results of the proposed design, technological, or operational solutions.	K2_ENG_U01, K2_ENG_U03, K2_ENG_U04
PEU_U03	The student is able to objectively justify the purpose of their original ideas and solutions during discussions and critically assess technical solutions proposed by others.	K2_ENG_U02, K2_ENG_U04
In terms of social competences		
PEU_K01	The student understands the need to enhance their professional and personal competencies and is aware of the social consequences of engineering activities.	K2_ENG_K01, K2_ENG_K05

PEU_K02	The student is able to collaborate and behave appropriately in a group, actively participate in professional discussions while maintaining respect for differing opinions and adhering to proper communication etiquette.	K2_ENG_K03
PEU_K03	The student is able to think and act in a creative and entrepreneurial way, and is capable of defining priorities that determine the success of a planned task.	K2_ENG_K01, K2_ENG_K03

Program content ensuring learning outcomes

Presentation of the requirements that a master's thesis must meet.
Presentation of the general principles of the diploma examination process.
Student presentations regarding the current state of knowledge in the area of their diploma theses. Improving the skills of searching for selective knowledge necessary to create original concepts and solutions, as well as preparing presentations that allow them to communicate these ideas effectively to others. Enhancing the skills of creative discussion, where proposed solutions or ideas can be justified in a factual and substantive manner.
Student presentations regarding achievements in their diploma theses. Improving the skills of writing a work on a specific topic, showcasing one's own achievements in the context of existing known solutions. Developing a sense of diligence and responsibility for the commitments made, both to oneself and to others.

Calculation of ECTS points

Activity form	**Activity hours**
Seminar	30
Preparation of a report/summary/presentation/paper	20
Student workload	**Hours** 50

Wrocław University of Science and Technology

Psychology of Communication

Educational subject description sheet

Basic information

Field of study
Power Engineering

Speciality
-

Organizational unit
Faculty of Mechanical and Power Engineering

Study level
second degree 3 semesters

Study form
full-time studies

Education profile
general academic profile

Education cycle
2025/2026

Subject code

Lecture languages
English

Mandatoriness
Elective

Block
Subjects from the fields of humanities or social sciences

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	The student appreciates the importance of humanistic and social knowledge for the practice of various ways of carrying out their professional duties, including the importance of communication skills, teamwork and mutual understanding.	K2_ENG_W09
In terms of social competences		
PEU_K01	The student appreciates the importance of continuous learning and deepening their various competences in an era of constantly changing world and development of technology and knowledge.	K2_ENG_K01
PEU_K02	Aware of his professional role, he is ready to act for the benefit of his social environment, among others by communicating his professional knowledge in a clear and understandable way.	K2_ENG_K02

Program content ensuring learning outcomes

Content from the field of social psychology and sciences of broadly understood communication, especially covering issues of various interpersonal relations, group influence, conformism, manipulation and defense against this, but also issues of conflicts and resolving them. The lecture also covers issues of preparing and presenting public speeches.

Calculation of ECTS points

Activity form	**Activity hours**
Lecture	15
Preparaton for classes	10
Preparation for an exam/credit	13
Self-study of class topics	10
Credit/Exam	2
Student workload	**Hours** 50

Wrocław University of Science and Technology

Communication in a Multicultural Environment

Educational subject description sheet

Basic information

Field of study Power Engineering **Speciality** - **Organizational unit** Faculty of Mechanical and Power Engineering **Study level** second degree 3 semesters **Study form** full-time studies **Education profile** general academic profile	**Education cycle** 2025/2026 **Subject code** **Lecture languages** English **Mandatoriness** Elective **Block** Subjects from the fields of humanities or social sciences

Semester	Activities, hours, ECTS and examination
Semester 3	• Lecture: 15 h, 2 ECTS, Graded credit

Subject's learning outcomes

Subject's outcome	Content	Learning outcome
In terms of knowledge		
PEU_W01	Analyses, argues and discusses understanding of the social, economic, political and legal determinants of engineering activities in an international environment.	K2_ENG_W09
In terms of social competences		
PEU_K01	Identifies and knows how to solve communication problems related to the functioning of a technical college graduate in society, respects the principles of good communication and demonstrates communication competence in an international environment.	K2_ENG_K01, K2_ENG_K02

Program content ensuring learning outcomes

The student learns about interdisciplinary issues in communication theory, international relations and culture, including transdisciplinary issues in the humanities and social sciences as well as engineering and technical sciences with particular reference to the specific field of study.

Calculation of ECTS points

Activity form	Activity hours
Lecture	15
Preparaton for classes	13
Preparation for an exam/credit	10
Self-study of class topics	10
Credit/Exam	2
Student workload	**Hours** 50