

## STUDY PROGRAMME CARD

Name (field of study): **ENVIRONMENTAL ENGINEERING**

Name of Faculty: **FACULTY OF MECHANICAL ENGINEERING**

Education program	Resolution of the Council of the Faculty	<b>24 April 2019</b>
	valid from the academic year	<b>2019/2020</b>
Study level		<b>2nd cycle studies</b>
Profile of education (academic / practical)		<b>General Academic</b>
The date and number of the resolution of the Senate establishing profile learning outcomes		<b>26.04.2017 r., Resolution No. 108</b>
Form of study (full-time studies/ part-time studies)		<b>Full-time studies</b>
Assignment to the area of education		<b>Technical sciences</b>
Identification of areas (science or art) and disciplines (scientific or artistic), to which outcomes of the learning program belong		<b>Environmental engineering, mining and energy</b>
Duration (semesters)		<b>3</b>
ECTS points		<b>90</b>
Professional title obtained by the graduate		<b>Master of Science</b>
ISCED classification		<b>0724 Mining and extraction 0712 Environmental protection technology</b>
Relationship with the mission of the university and its development strategy		<b>Education in this field combines the best traditions of technical ideas with the tasks of today and challenging given by the rapid technological changes of the modern world. The educational activities and research faculty joins the need for development of modern thought to the economic and business prospects of the country with the creation of the ethical values of science and technology. Around this mission focus, teachers and students, researchers and administrative staff, as well as representatives of the economic and social environment of the school. The basic components of the mission are: education, research and social activity. This promotes the integration and development of science and stimulates creativity and strengthens social ties with the region.</b>

Objectives of education and employment opportunities and to continue studies	<b>Degree in this field of education provides education of specialists who on the basis of the acquired knowledge of engineering studies (I-cycle studies) and acquired practical skills, as well as a program of 2nd cycle studies will have to prepare for work in the area of specialized issues related to the field of study, in order to technical and technological, economic and ecological satisfaction of social needs. Graduates of the 2nd cycle studies can continue their studies in doctoral studies - (Third cycle)</b>	
Prerequisites – expected competence of the candidate (especially in the case of second cycle)	<b>Technical interest, analytical skills and knowledge of mathematics, physics and chemistry, the interest of human impact on the environment, focus on the research for new solutions, scientific mind. The candidate should also have the ability to solve problems and be oriented to work in a group.</b>	
Rules of enrollments rules (pursuant to Enrollment a resolution)	<b>The candidate should have an engineer degree or equivalent, obtained in the same or related field of study. Criterion for admission to second cycle is equal to the value of the index ranking of diploma evaluation of previous studies on the same or a related direction. In the case of lack of a diploma, the candidate can provide a certificate of passing the diploma examination. The original or a copy of the diploma (released by the university) with a supplement in this case must be delivered, the deadline set by the Recruitment Commission.</b>	
Differences in relations to other programs with similar objectives and defined learning outcomes conducted at the Opole University of Technology	<b>Not applicable</b>	
Methods of verification the assumed learning outcomes	<b>The list of exams and assessment principles in various subjects are included in the subject cards.</b>	
Summary indicators characterizing the training program, and in that:	The total number of ECTS points, that the student must obtain the classes require direct participation of teachers	<b>70</b>
	The total number of ECTS points, that the student must obtain the classes in the field of basic science, to which the learning outcomes for a particular program of education, training and levels and profiles.	<b>13</b>
Summary indicators characterizing the trainings program and in that:	The total number of ECTS points that the student must obtain the classes of practical considerations such as laboratory classes, workshop and design	<b>47</b>
	The minimum number of ECTS points, that the student must obtain implementing training modules/courses offered in the form of classes or other university faculty	<b>5</b>
	The number of ECTS points that the student has	<b>1</b>

	to obtain is the physical education classes	
	The number of ETCS points, that the student has to obtain the foreign language classes	<b>2</b>
	The number of ETCS points, that the student must obtain in courses in the humanities area.	<b>5</b>
	The percentage of the number of ETCS points for the area of education and the total number of points – necessary to determine for each area of education, in the case of the curriculum for the training program, assigned to more than one area of education	<b>100%</b>

The program of studies reviewed by Faculty Student Council

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Signature of the representative of  
Faculty Student Council

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date, signature, stamp of the Dean

**Table of the major-related educational learning outcomes**

Education Programme (field of study) <b>Environmental engineering spec. Advanced Technology of Environmental Engineering (ATEE)</b> Level of study Second cycle - level seven of the Polish Qualification Framework profile of education: general academic	
Symbol of major-related educational outcomes	Major-related educational outcomes
<b>Knowledge</b>	
IS_K2_W01	Student has in-depth knowledge of selected fields in mathematics, physics, chemistry, biology and earth sciences to the extent necessary to describe phenomena and processes related to environmental engineering technologies and has knowledge of spatial planning.
IS_K2_W02	Student has advanced knowledge of the principles of identification of hazards, occupational health and safety and ergonomics during the construction and operation of installations used in environmental engineering.
IS_K2_W03	Student has in-depth knowledge of conventional and alternative energy sources as well as technical and technological possibilities for their acquisition, conversion and application.
IS_K2_W04	Student has advanced knowledge of statistical methods of data analysis and development of measurement results.
IS_K2_W05	Student has in-depth knowledge of modelling of processes, phenomena and devices, knows numerical and computerised methods and tools useful for solving engineering tasks in the field of environmental engineering.
IS_K2_W06	Student has in-depth knowledge of the environmental management methods, tools and models, including waste management.
IS_K2_W07	Student has in-depth knowledge of the preparation and use of project documentation and the organisation of construction and installation works; knows the principles of designing environmental engineering processes, facilities and systems with regard to their environmental impact and reliability and safety of use.
IS_K2_W08	Student has advanced knowledge of the principles of design of apparatus and devices used in environmental engineering and development trends in the construction of technical installations.
IS_K2_W09	Student has advanced knowledge of the principles of engineering design and computer programming that support the design of environmental infrastructure.
IS_K2_W10	Student has in-depth knowledge in the observation of phenomena and processes and knows the methods of making measurements of characteristic quantities that are important from the point of view of environmental engineering; knows the methods, techniques and equipment for studying physical, chemical and biological phenomena and has knowledge of the life cycle of technical devices, facilities and systems.
IS_K2_W11	Student has specialist knowledge for solving environmental engineering problems.
IS_K2_W12	Student has structured and theoretically underpinned knowledge covering the key issues in the field of environmental engineering and innovative technologies. Has in-depth knowledge of the role of the natural environment; is aware of the risks and knows how to identify and reduce them.
IS_K2_W13	Student has advanced knowledge of methods, techniques, tools and materials used to solve complex engineering tasks in the field of environmental engineering.
IS_K2_W14	Student knows and understands the fundamental dilemmas of modern civilisation thanks to their advanced knowledge.
IS_K2_W15	Student has in-depth knowledge of the application of legal regulations, standards and guidelines in the design and operation of technical facilities as well as understanding of social, economic, legal and other non-technical aspects of engineering activity.
<b>Skills</b>	
IS_K2_U01	Student uses other authors' intellectual achievements, respecting copyrights and using literature, databases and other sources related to technical sciences; is able to integrate

	the obtained information, interpret it, draw conclusions and formulate opinions.
IS_K2_U02	Student is able to use statistical methods in the development of data and environmental analyses and uses computer software to solve engineering tasks.
IS_K2_U03	Student is able to prepare and present an assigned environmental engineering problem in both Polish and a foreign language recognised as a basic language.
IS_K2_U04	Student is able to use a foreign language at the B2+ level of the Common European Framework of Reference for Languages and at a higher level within the specialist terminology.
IS_K2_U05	Student is able to plan, execute and direct others in the process of lifelong learning.
IS_K2_U06	Student is able to use information and communication techniques, formulate graphically and descriptively the guidelines for carrying out tasks typical of engineering activity.
IS_K2_U07	Student is able to use measuring apparatus and has the ability to estimate errors and plan and conduct experiments, interpret the obtained results and formulate conclusions.
IS_K2_U08	Student is able to carry out an analysis of an engineering task and apply simulation methods to solve it, interpret the obtained results, draw conclusions and test hypotheses.
IS_K2_U09	Student is able to see systemic and non-technical aspects while formulating and solving engineering tasks.
IS_K2_U10	Student is able to use project documentation, evaluate project costs, apply the principles of organisation of installation works and conduct a preliminary economic analysis of undertaken engineering activities.
IS_K2_U11	Student is able to solve complex engineering and research tasks and critically analyse how they work, as well as evaluate the existing environmental engineering solutions, including those containing a research component and assess the suitability of different methods and tools for solving them.
IS_K2_U12	Student is able to design and construct a device, facility, system or process typical of environmental engineering, using appropriate methods, techniques and tools in accordance with the provided specification.
<b>Social skills</b>	
IS_K2_K01	Student understands the need to learn, improve the professional skills and is able to inspire and organise the learning process of others.
IS_K2_K02	Student understands the importance of the need to ensure safe working conditions.
IS_K2_K03	Student correctly identifies engineering problems and is able to prioritise professional activities.
IS_K2_K04	Student is able to cooperate and work in a group, taking on different roles; understands the importance of teamwork and can independently plan, implement and direct others in the lifelong learning process. Understands the social role of an engineer and understands the need to provide the public with reliable information on engineering achievements.
IS_K2_K05	Student is aware of the importance and understands the non-technical aspects and consequences of the engineering activity, including its environmental impact and the related responsibility for the decisions made.
IS_K2_K06	Student is aware of the importance of professional conduct, adherence to professional ethics and respecting the diversity of views and opinions.
IS_K2_K07	Student is able to think and act in a creative, innovative and entrepreneurial way and critically evaluate the received content.

#### Explanations

The symbol of the effect consists of:

- letter K - discriminator of directional effects,
- number 1 - first-cycle studies,
- \_ sign (underscore),
- letters W, U or K - designation of effects categories (W - knowledge, U - skills, K - social skills),
- 01, ... - effect number within a given category, written in the form of two digits (numbers 1-9 should be preceded by the number 0).

WYDZIAŁ MECHANICZNY



**PLANY I PROGRAMY STUDIÓW**  
***STUDY PLANS AND PROGRAMS***

**KIERUNEK STUDIÓW - *FIELD OF STUDY***

- INŻYNIERIA ŚRODOWISKA

- *ENVIRONMENTAL ENGINEERING*

***Studia stacjonarne***  
***drugiego stopnia***  
***- wg specjalności***

***Second Cycle Programme - Full-Time Studies***

## CHARAKTERYSTYKA OGÓLNA

**kierunek studiów:** INŻYNIERIA ŚRODOWISKA

**specjalność:** ADVANCED TECHNOLOGIES IN ENVIRONMENTAL ENGINEERING

**profil:** OGÓLNOAKADEMICKI

**nazwa wydziału:** WYDZIAŁ MECHANICZNY

<b>plan studiów</b>	uchwała Rady Wydziału z dnia	<b>24.04.2019</b>
	obowiązuje od roku akademickiego	<b>2019/2020</b>
<b>forma studiów (stacjonarne / niestacjonarne)</b>	<b>stacjonarne</b>	
<b>poziom studiów (I stopnia / II stopnia)</b>	<b>II-go stopnia</b>	
<b>czas trwania (w sem.)</b>	<b>3</b>	
<b>tytuł zawodowy otrzymywany przez absolwenta</b>	<b>magister inżynier</b>	
<b>liczba punktów ECTS</b>	<b>90</b>	

## PLAN STUDIÓW – STUDY PLAN

<b>POLITECHNIKA OPOLSKA WYDZIAŁ MECHANICZNY</b>	<b>OPOLE UNIVERSITY OF TECHNOLOGY FACULTY OF MECHANICAL ENGINEERING</b>
<b>Kierunek studiów: INŻYNIERIA ŚRODOWISKA</b>	<b>Field of study: ENVIRONMENTAL ENGINEERING</b>
<b>STUDIA STACJONARNE DRUGIEGO STOPNIA – MAGISTERSKIE</b>	
<b>SECOND CYCLE PROGRAMME - FULL-TIME STUDIES (Master of Science degree)</b>	

<b>SPECJALNOŚĆ – SPECIALIZATION:</b>
<b>ADVANCED TECHNOLOGIES IN ENVIRONMENTAL ENGINEERING - ADVANCED TECHNOLOGIES IN ENVIRONMENTAL ENGINEERING</b>

SEMESTR: 1 (1 <sup>st</sup> Semester)		Liczba godzin zajęć w semestrze; E – egzamin Working time (hours) a semester; E – Exam					ECTS	TYP
Nr	Przedmiot Subject unit – semester curricular	W (Lecture)	C (Practical classes)	L (Laboratory classes)	P (Project)	S (Seminar)		
1.1	Environmental Statistics Statystyka w Inżynierii Środowiska	15	–	15	–	–	2	P
1.2	Advanced Environmental Chemistry Chemia środowiska	15E	–	15	–	–	2	P
1.3	Modern Materials in Engineering Applications Nowoczesne materiały w zastosowaniach inżynierskich	15	–	–	–	–	1	P
1.4	Safety and Reliability of Engineering Systems Niezawodność i bezpieczeństwo systemów inżynierskich	15	–	–	–	15	2	P
1.5	Computer Aided Design Komputerowe Wspomaganie Projektowania	15	–	–	30	–	3	P
1.6	Data Bases and Advanced GIS Bazy danych i zaawansowany GIS	15	–	30	–	–	3	P
1.7	Heat and Mass Transfer Processes Design Projektowanie procesów wymiany ciepła i masy	30E	15	–	15	–	5	Ko
1.8	Environmental Analytics Analityka środowiskowa	15	–	15	–	–	2	Ko
1.9	Water Treatment Technologies Technologie uzdatniania wody	15E	–	15	15	–	3	Ks
1.10	Clean Fossil and Alternative Fuels Czyste paliwa konwencjonalne i paliwa alternatywne	15	–	15	–	–	2	Ks
1.11	Technical English Support/Polish Language Techniczny język angielski/Język polski	–	–	30	–	–	2	Dod
Przedmioty obieralne humanistyczno-społeczne – wymagana liczba p. ECTS w semestrze (Optional units – compulsory ECTS in a semester)							3	
1.12	Module I: Communication and Negotiations in Business Komunikacja i negocjacje w biznesie	30	–	–	–	–	(3)	Hsw
	Module I: Sustainable Development for Engineers Zrównoważony rozwój dla inżynierów	30	–	–	–	–	(3)	Hsw
Liczba godzin w semestrze (Number of hours in a semester)		195	225				30	
Razem godzin/ECTS w semestrze (Total hours/ECTS in a semester)		420						



SEMESTR: 2 (2 <sup>nd</sup> Semester)		Liczba godzin zajęć w semestrze; E – egzamin Working time (hours) a semester; E – Exam					ECTS	TYP
Nr	Przedmiot	W	C	L	P	S		
		Subject unit – semester curricular	(Lecture)	(Practical classes)	(Laboratory classes)	(Project)	(Seminar)	
2.1	Renewable Energy Technologies	30E	–	15	–	–	4	Ko
	Technologie Odnawialnych Źródeł Energii							
2.2	Bioprocess Technologies in Engineering	30	15	–	–	–	3	P
	Technologie Bioprosesowe							
2.3	Biological Wastewater Treatment	15	–	15	15	–	3	Ks
	Biologiczne oczyszczanie ścieków							
2.4	Techniques of Air Pollution Control	15E	–	30	–	–	4	Ks
	Techniki pomiaru zanieczyszczeń powietrza							
2.5	Environmental Fluid Transport	15	–	15	15	–	3	Ks
	Transport płynów w Inżynierii Środowiska							
2.6	Technologies of Material Reuse	15E	–	–	–	15	2	Ks
	Technologie odzysku materiałowego							
2.7	Waste to Energy - Application Technologies	15	–	–	–	15	2	Ks
	Energetyczne wykorzystanie odpadów							
Przedmioty obieralne humanistyczno-społeczne – wymagana liczba p. ECTS w semestrze (Optional units – compulsory ECTS in a semester)							3	
2.8	Module II: Creativity Training	30	–	–	–	–	(2)	HSw
	Trening kreatywności							
	Module II: Ethics in Business	30	–	–	–	–	(2)	HSw
	Etyka biznesu							
2.9	Module III: Design Thinking	15	–	–	–	–	(1)	HSw
	Myślenie projektowe							
	Module III: Enviromental Law and Policy	15	–	–	–	–	(1)	HSw
	Prawo i normy ochrony środowiska							
Przedmioty obieralne fakultatywne – wymagana liczba p. ECTS w semestrze (Optional units – compulsory ECTS in a semester)							6	
2.10	Elective subject: Energy Consumption of Industrial Processes	15	15	–	–	–	(2)	Fak
	Przedmiot obieralny: Energochłonność procesów przemysłowych							
	Engineering of Chemical Reactors	15	15	–	–	–	(2)	Fak
	Inżynieria Reaktorów Chemicznych							
2.11	Elective subject: Mass Exchanger Design	15	–	–	15	–	(2)	Fak
	Przedmiot obieralny: Projekt wymiennika masy							
	Spatial Planning and Urban Design	15	–	–	15	–	(2)	Fak
	Planowanie przestrzenne i urbanistyka							
2.12	Elective subject: Advanced Environmental Metrology	15	–	15	–	–	(2)	Fak
	Przedmiot obieralny: Zaawansowane techniki pomiarowe w metrologii środowiska							
	Multiphase Flow in Environmental Technology	15	–	15	–	–	(2)	Fak
	Przepływy wielofazowe w technologii inżynierii środowiska							
Liczba godzin w semestrze (Number of hours in a semester)		225	195 (w tym 45 godz. obieralne)				30	
Razem godzin/ECTS w semestrze (Total hours/ECTS in a semester)		420						

SEMESTR: 3 (3 <sup>rd</sup> Semester)		Liczba godzin zajęć w semestrze; E – egzamin Working time (hours) a semester; E – Exam					ECTS	TYP
Nr	Przedmiot	W	C	L	P	S		
		Subject unit – semester curricular	(Lecture)	(Practical classes)	(Laboratory classes)	(Project)	(Seminar)	

3.1	Modelling of Water Distribution Systems	15	-	15	-	-	2	Ks
	Modelowanie systemów zaopatrzenia w wodę							
3.2	Modelling of Pollutant Propagation in Atmosphere	15	-	15	-	-	2	Ks
	Modelowanie rozprzestrzeniania zanieczyszczeń w atmosferze							
3.3	Energy Analysis and Feasibility Studies	15	-	-	15	-	2	Ks
	Analizy energetyczne i studia wykonalności							
3.4	Modelling of Energy Systems	15E	-	-	15	-	2	Ks
	Modelowanie systemów energetycznych							
3.5	Diploma Seminar	-	-	-	-	15	2	Ks
	Seminarium dyplomowe							
3.6	Master's Thesis	E - godziny niekontaktowe (un-contact hours)					20	Ks
	Praca magisterska							
Liczba godzin w semestrze (Number of hours in a semester)		60	-	30	30	15	30	
Razem godzin/ECTS w semestrze (Total hours/ECTS in a semester)		135						

PLAN STUDIÓW RAZEM (TOTAL STUDY PLAN)		ECTS
Łącznie godzin kontaktowych/ECTS w planie studiów	975	90
Total contact hours/ECTS in study plan		

STATYSTYKA PROGRAMU KSZTAŁCENIA			
Typ	Przedmioty - p. ECTS razem	wg planu	udział
P	Podstawowe	16	17.78 %
Ko	Kierunkowe - ogólne	11	12.22 %
Ks	Kierunkowe - dla specjalności	49	54.44 %
Dod	Dodatkowe	2	2.22 %
HSw	Obieralne - humanistyczno-społeczne	6	6.67 %
Fak	Obieralne - fakultatywne	6	6.67 %
<b>Łącznie:</b>		90	100.00 %

Program kształcenia dostosowany do wydziałowych efektów uczenia się dla kierunku studiów INŻYNIERIA ŚRODOWISKA (studia drugiego stopnia)  
Plan i program studiów:  
– uchwalony przez Radę Wydziału Mechanicznego w dniu 24.04.2019  
– zaopiniowany przez wydziałowy organ samorządu studenckiego.