OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of study	Full-time studies
Semester	FIRST

Course Title		Advanced Environmental Chemistry					Basic Science (Y/N)	Y
Tytuł przedmiotu		Chemia środowiska						
ECTS points						Mode of complete the course	Course code	
Total	2	Cont.	1,2	Pract.	1,2	Exam	A.2.	
Preliminary requirements of the course		Name of course		Chemistry, Environmental protection				
		Knowledge	1.	Student has extended and deepened knowledge of mathematics, physics, chemistry and other areas appropriate for the field of study useful for formulating and solving complex tasks related to the field of				
			2.	Student has detailed knowledge of the fields of study related with the studied field of study.				
		Skills	1.	Student is able to obtain information from the literature, databases and other properly selected sources in English.				
			2.	Student is able to plan and carry out experiments, inrpret the results and draw conclusions.				
		Social Competence	1.	Student understands the need for the lifelong leraning.				

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surmame)
Lecture	29	15	PhD eng. Joanna Guziałowska-Tic
Calculation class			
Labolatory class	29	15	PhD eng. Joanna Guziałowska-Tic
Project			
Seminar			
Total	58	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in classroom

Item	Content of course	Hours
1.	Comparison between chemistry and environmental chemistry	1
2.	The properties of water, a unique substance	1
3.	Sources and uses of water: hydrologic cycle	1
4.	Aquatic chemistry	1
5.	Water pollution	1
6.	Physical characterisctic of the atmosphere	1
7.	Organic and inorganic air pollutants	1
8.	Chemical and photochemical reactions in the atmosphere	1
9.	Microbially mediated elemental trnasitions and cycles. Transformations of Carbon, Nitrogen, Sulfur and Phosphorus	1
10.	Global climate and microclimate	1

11.	The nature of solids in the geosphere	1
12.	Environmental aspects of the geosphere	1
13.	Nature and composition of soil	1
14.	Nittrogen, Phosphorus and Pottasium in soil	1
15.	Environmental chemistry of hazordous waste	1

Sudent's own study (h)	14	Contact hours per semester	15

LABORATORY CLASS	Execution method	Laboratory exercises

Item	Content of course	Hours
1.	WHS in the laboratory of environmental chemistry. Getting acquainted with the principles of using research apparatus	1
2.	Marking of choosen metals with spectrophotometric methods	2
3.	The marking of the dry matter content and humidities with method of the scale	2
4.	Environmental chemistry of water and industrial wastewater	2
5.	Environmental chemistry of soil	2
6.	Environmental chemistry of chemical industry wastes	2
7.	Environmental chemistry of mining wastes	2
8.	Environmental chemistry of steel industry wastes	2

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Report of laboratory analyses		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has broadened and deepened knowledge of selected fields of mathematics, physics, chemistry, biology and earth science in terms necessary to describe phenomena and processes related to environmental engineering technology.	LE	IS_K2_W01
	2.	Student knows methods, techniques and equipment for analyzing physical, chemical and biological phenomena from the perspective of engineering and environmental protection, has basic knowledge of life cycle of equipment, objects and technical systems.	LA	IS_K2_W15
	3.	Student demonstrates structured and theoretically underpinned basic knowledge which includes main issues of environmental engineering. Student has knowledge about role of environment, is aware of risks and knows methods of their identification and limitation.	LE	IS_K2_W16
Skills	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	LE	IS_K2_U01
	2.	Student can use statistical methods in data development and environmental analysis.	LA	IS_K2_U03
	3.	Student has the skills of phenomena and process observation and is able to do experimental measurements of characteristic physical,chemical and biological quantities relevant to environmental engineering and to interpret the results.	LA	IS_K2_U18
Social Competence	1.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	LE	IS_K2_K01
	2.	Student can understand the importance of necessity to provide safe working environment.	LA	IS_K2_K02
	...			

Teaching methods:

– lecture
– laboratory class

Form of assessment:

Form:	Writing exam
Condi-tions:	Exam - pass all parts of this subject and positive note from the test

Basic references:

[1] Manahan, Stanley E. "Frontmatter" Foundamentals of environmental chemistry. Boca Raton. CRC Press, LLC, 2001.

[2] Hites R.A., Raff J.D. Elements of environmental chemistry. Wiley 2012.

Additional references:

[1] Spiro T.G, Purvis-Roberts K.L. Stigliani W.M. Chemistry of th environment. University Science Book, 2011.

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Head of the organizational unit *(stemp/signature)*	Dean of Mechanical Faculty *(stemp/signature)*

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Filed of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	SECOND

Course Title		Advanced Environmental Metrology					Basic Science (Y/N)	N
Tytuł przedmiotu		Zaawansowane techniki pomiarowe w metrologii środowiska						
ECTS points						Mode of complete the course	Course code	
Total	2	Cont.	1,2	Pract.	1,2	Coruse Credit	E.10.	
Preliminary requirements of the course		Name of course						
		Knowledge		1.	Student has good knowledge about basic physics laws.			
				2.	Student has basic knowledge about measurement process.			
		Skills		1.	Student has selfeducation skills, should be able to work both solo and as a team member.			
				2.	Student can consult the catalogues of devices.			
		Social Competence		1.	Student is competent in creative thinking.			
				2.	Student is competent to ability to cooperate.			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	29	15	PhD eng. Daniel Zając
Calculation class			
Laboratory class	29	15	PhD eng. Daniel Zając
Project			
Seminar			
Total	58	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in audition room

Item	Content of course	Hours
1.	Introduction to environmental measurements	1
2.	Measurement uncertainty	1
3.	Temperature measurements	1
4.	Pressure measurements	1
5.	Fluid flow measurements	1
6.	Humidity measurements	1
7.	Level of a substance measurements	1
8.	Viscosity measurements	1
9.	Density measurements	1
10.	Chemical composition measurements	1
11.	pH measurements	1
12.	Ionizing radiation measurements	1
13.	Noise measurements	1
14.	Vibration measurements	1
15.	Advanced measurement systems	1

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Written test		

LABORATORY CLASS	Execution method	Laboratory measurement

Item	Content of course	Hours
1.	Uncertainty calculation	2
2.	Temperature measurements	2
3.	Thermovision measurements	2
4.	Pressure measurements	2
5.	Fluid flow measurements with the use of orifice	1
6.	Non-invasive fluid velocity measurements	2
7.	Determination of fluid flow by integrating the velocity field	1
8.	Density measurements	1
9.	Viscosity measurements	1
10.	Fractional analysis	1

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Individual reports of the laboratory measurements		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student knows methods, techniques and equipment for analyzing physical, chemical and biological phenomena from the perspective of engineering and environmental protection, has basic knowledge of life cycle of equipment, objects and technical systems.	LE, LA	IS_K2_W15
	2.	Student knows methods, techniques, tools and materials used in solving complex engineering tasks in the field of environmental engineering.	LE, LA	IS_K2_W18
Skills	1.	Student is able to plan and carry out experiments, to interpret the results and to draw conclusions.	LE, LA	IS_K2_U12
	2.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	LE, LA	IS_K2_U01
Social Competence	1.	Student is able to interact and work in a group performing different roles; Student can uderstand the importance of collective action.	LE, LA	IS_K2_K04

Teaching methods:

– lecture
– calculation class

Form of assessment:

Form:	Writing exam
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

Fraden J.: Handbook of modern sensors: physics, degigns, and applications. Springer-Verlag, New York, [1] 2004

Liptak B.G.: Process measurement and analysis – Instrument engineers' handbook, vol. 1., CRC Press, [2] Boca Raton USA, 2003

Additional references:

[1] Webster J.G.: (1999) Measurement instrumentation and sensors, CRC Press LLC, 1999

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Head of the organizational unit **Dean of Mechanical Faculty**

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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	SECOND

Course Title		Biological wastewater treatment				Basic Science (Y/N)	N
Tytuł przedmiotu		Biologiczne oczyszczanie ścieków					
ECTS points						Mode of complete the course	Course code
Total	3	Cont.	1,8	Pract.	2,3	Coruse Credit	C.1.2.
Preliminary requirements of the course		Name of course		Chemistry, biology and ecology			
		Knowledge	1.	Students has the knowledge from basic areas of chemistry and biology necessary to describe phenomena and processes related to wastewater treatment technologies. One has background in unit processes and operations			
			2.	Students knows the methods, techniques, and equipment for testing of physical phenomena, chemical and biological point of view of the water and wastewater treatment			
		Skills	1.	Students obtains information from literature, databases, and other sources related to the technical sciences; can integrate the information obtained, to make their interpretation, draw conclusions and formulate opinions			
			2.	Student has a self-learning skills; working individually and in a team			
		Social Competence	1.	Able to interact and work in a group, understand the importance of team activities			
			2.	Student can think and act in a creative and innovative way			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	29	15	PhD eng. Joanna Boguniewicz-Zabłocka
Calculation class			
Labolatory class	29	15	PhD eng. Joanna Boguniewicz-Zabłocka
Project	29	15	PhD eng. Joanna Boguniewicz-Zabłocka
Seminar			
Total	87	45	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in classroom

Item	Content of course	Hours
1.	Introduction to biological wastewater treatment	1
2.	Classification and fundamentals of biochemical operations	1
3.	The type and role of microorganisms used in the biological wastewater treatment	1
4.	Stoichiometry and kinetics of biological wastewater treatment	2
5.	Aerobic and Anaerobic Processes in wastewater treatment	2
6.	Activated Sludge design	2
7.	Technology and equipment used in the processes of biological phosphorus removal	2

8.	Technology and equipment used in the processes of biological nitrogen removal	2
9.	Activated Sludge Models 1 and 2d	2

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	test		

LABORATORY CLASS	Execution method	Laboratory tests

Item	Content of course	Hours
1.	Introduction	1
2.	Standards for biological pollutions determination	2
3.	Determination of BOD	2
4.	Biological vulnerability assessment (COD determination)	2
5.	Microscopic examination of activated sludge	2
6.	Microscopic examination of biofilm	2
7.	Additional phosphorus removal	2
8.	Nesessery degree of treatment assessment	2

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Entrance test before work in labolatory and mark for laboratory work.		

PROJECT	Execution method	Individual work in classroom

Item	Content of course	Hours
1.	Design example of conventional activated sludge process for municipal wastewater. Individual project performance of wastewater treatment plant for the given parameters. Selection of the appropriate method of treatment. Determination of the technological parameters of the unit operations and processes. Draw up the flowsheet	15

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Individual mark based on project done		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student knows methods, techniques, tools and materials used in solving complex engineering tasks in the field of environmental engineering.	LE, LA, P	IS_K2_W18
	2.	Student is able to carry out the analysis of engineering tasks and apply simulation methods leading to the solution, interpret the results, draw conclusions and test the hypothesis.	P	IS_K2_W14
Skills	1.	Student can - in accordance with set specification - design and implement a simple device, object, system or process typical for environmental engineering using appropriate methods, techniques and tools.	P	IS_K2_U22
	2.	Student is able to carry out the analysis of engineering tasks and apply simulation methods leading to the solution, interpret the results, draw conclusions and test the hypothesis.	LE	IS_K2_U14
	3.	Student can use information and communication techniques necessary for the implementation of typical engineering activities	LE, P	IS_K2_U10
	...			
Social Competence	1.	Student uses intellectual achievements of other authors complying with copyright law in order to prepare scientific papers.	LE, LA	IS_K2_K02
	2.	Student is able to communicate in the range relating to environmental engineering using different techniques in various environments, also in a foreign language.	LA	IS_K2_K05
	3.			

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Teaching methods:

– lecture
– laboratory class
– project

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Henze, M., Harremoes, P., Cour Jansen, J.I., and Arvin, E. (2002) Wastewater Treatment: Biological and Chemical Processes, 3rd Ed. Springer, Berlin,

[2] Grady, C.P.L., Daigger, G.T., and Lim, H. (1998) Biological Wastewater Treatment, 2nd Ed. Marcel Dekker, New York, 1096 pp., ISBN 0-8247-8919-9

[3] Tchobanoglous G. i inni: Wastewater Engineering: Treatment and Reuse. MC Grov Hill 2003

Additional references:

[1] Law Act. Norms.

[2] Unit Operations and Processes in Environmental Engineering, 2nd Edition, by Tom D. Reynolds and Paul A. Richards, PWS Publishing Company, 1995

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Head of the organizational unit
(stemp/signature)

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Dean of Mechanical Faculty
(stemp/signature)

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Filed of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	FIRST

Course Title		Bioprocess Engineering					Basic Science (Y/N)	N
Tytuł przedmiotu		Technologie Bioprocesowe						
ECTS points						Mode of complete the course	Course code	
Total	4	Cont.	1,8	Pract.		Coruse Credit	B.3.	
Preliminary requirements of the course		Name of course		Fundamentals of heat and mass transfer; Machinery and equipment				
		Knowledge		1.	Student has knowledge about heat and mass balance conditions.			
				2.	Student has the ability to identify machines and equipment.			
		Skills		1.	Student is able to obtain information from the literature.			
				2.	Student uses worksheets.			
		Social Competence		1.	Student understands the need for further training and improve their skills.			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	55	30	PhD Eng. Małgorzata Płaczek
Calculation class	29	15	PhD Eng. Małgorzata Płaczek
Labolatory class			
Project			
Seminar			
Total	84	45	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	lecture in the auditorium

Item	Content of course	Hours
1.	Introductory information. The history of biotechnology development and its implications for science, industry, agriculture, medicine and the environment	2
2.	State of the art and directions of bioeconomy development	2
3.	General characteristics and classification of bioprocesses.	2
4.	Microorganisms for industrial use. Acquiring and preparation of culture	2
5.	Types of microbial cultures	2
6.	Kinetics of microbial growth. Models of growth.	2
7.	Culture preservation and sterilization processes	2
8.	Classification and overview of the design of bioreactors.	2
9.	Heat and mass transfer in bioreactor	3
10.	Scale-up of bioreactor processes	2
11.	The processes of isolation, purification and bioproduct formation	3
12.	Manufacturing technology of selected bioproducts	2
13.	The use of bioprocesses in environmental protection	2
14.	Ethical, economic, legal and social aspects of biotechnology	2

Sudent's own study (h)	25	Contact hours per semester	30
Methods of checking intended learning outcomes	Test		

CALCULATION CLASS	Execution method	Computational exercises in the classroom

Item	Content of course	Hours
1.	Biochemical basis of bioprocesses. Fundamentals of balance for microbial growth	1
2.	Mass balance of microbial growth. Elementary Balance	2
3.	Energy balance of microbial growth	2
4.	The kinetics of biomass growth - growth models	2
5.	Calculation of heat and mass transfer in the bioreactor	2
6.	The process of aeration and agitation in the bioreactor	2
7.	Sterilization	2
8.	Scale-up of bioreactor processes	2

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Test		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student knows the designing rules of devices and equipment used in environmental engineering and is familiar with development trends in construction of environmental protection installations.	LE, C	IS_K2_W10
	2.	Student has current knowledge in the field of innovative technologies used in environmental engineering and related science disciplines, knows the principle of sustainable development.	LE, C	IS_K2_W17
	3.	Student knows methods, techniques, tools and materials used in solving complex engineering tasks in the field of environmental engineering.	LE, C	IS_K2_W18
Skills	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	LE, C	IS_K2_U01
	2.	Student uses computer programs to solve engineering tasks.	LE, C	IS_K2_U04
	3.	Student has autonomous learning skills, works individually and in a team.	LE, C	IS_K2_U08
Social Competence	1.	Student is able to interact and work in a group performing different roles; Student can uderstand the importance of collective action.	LE, C	IS_K2_K04
	2.	Student can understand the social role of an negineer and can understand the need for reliable public information about the achievements of engineering.	LE, C	IS_K2_K08
	3.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	LE, C	IS_K2_K01
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Teaching methods:

– lecture
– calculation class

Form of assessment:

Form:	**Writing test**
Condi-tions:	**Course Credit + pass all parts of this subject**

Basic references:

[1] Doran M.P.: Bioprocess Engineering Principles, Academic Press Limited, UK 2000

[2] Ratledge C., Kristiansen B. (eds.): Basic Biotechnology, 3rd edition, Cambridge University Press, 2006 Success, VILEY-VCH Verlag GmbH & Co KGaA Weinheim 2010

[3] Najafpour G.: Biochemical Engineering and Biotechnology, Elsevier BV 2007

Additional references:

[1] Lecture notes and materials prepared by the teacher.

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Head of the organizational unit
(stemp/signature)

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Dean of Mechanical Faculty
(stemp/signature)

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	SECOND

Course Title		Chemical Reactors Engineering					Basic Science (Y/N)	N
Tytuł przedmiotu		Inżynieria Reaktorów Chemicznych						
ECTS points						Mode of complete the course	Course code	
Total	4	Cont.	1,2	Pract.		Coruse Credit	E.6.	
Preliminary requirements of the course		Name of course		Mathematics, General Chemistry, Process thermodynamics, Heat transfer processes, Industrial equipment knowledge				
		Knowledge		1.	Student lis able to do simple process calculations.			
				2.	Student has knowledge of thermodynamic calculations.			
				3.	Recognizes systems and equipment.			
		Skills		1.	Student is able to obtain information from the literature.			
				2.	Student understands the methods of processes balancing and can interpret the results of calculations.			
		Social Competence		1.	Student understands the need for further training and improve their skills.			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	25	15	PhD eng. Małgorzata Płaczek
Calculation class	25	15	PhD eng. Małgorzata Płaczek
Labolatory class			
Project			
Seminar			
Total	50	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in the auditorium

Item	Content of course	Hours
1.	Introduction to chemical reactor engineering	1
2.	The stoichiometry of the chemical reaction	2
3.	Kinetics of chemical reaction	2
4.	Reactors for homogeneous and heterogeneous systems - characteristic	3
5.	Mass and energy balances for different types of reactors	3
6.	The reactions in homogeneous systems	2
7.	Stability and optimization of reactors	2

Sudent's own study (h)	10	Contact hours per semester	15
Methods of checking intended learning outcomes	Written test		

CALCULATION CLASS	Execution method	Computational exercises in the classroom

Item	Content of course	Hours
1.	The stoichiometry of the chemical reaction	1

2.	Chemical Statics	2
3.	The rate of chemical reactions	2
4.	Homogeneous isothermal reactors	2
5.	Heterogeneous reactors	2
6.	Cascade of stirred tank reactors	2
7.	Thermal effects in chemical reactors	2
8.	Optimisation of reactor processes	2

Sudent's own study (h)	10	Contact hours per semester	15
Methods of checking intended learning outcomes	Written test		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student knows the designing rules of devices and equipment used in environmental engineering and is familiar with development trends in construction of environmental protection installations.	LE, C	IS_K2_W10
	2.	Student has current knowledge in the field of innovative technologies used in environmental engineering and related science disciplines, knows the principle of sustainable development.	LE, C	IS_K2_W17
	3.	Student knows methods, techniques, tools and materials used in solving complex engineering tasks in the field of environmental engineering.	LE, C	IS_K2_W18
Skills	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	LE, C	IS_K2_U01
	2.	Student uses computer programs to solve engineering tasks.	LE, C	IS_K2_U04
	3.	Student has autonomous learning skills, works individually and in a team.	LE, C	IS_K2_U08
Social Competence	1.	Student is able to interact and work in a group performing different roles; Student can uderstand the importance of collective action.	LE, C	IS_K2_K04
	2.	Student can understand the social role of an negineer and can understand the need for reliable public information about the achievements of engineering.	LE, C	IS_K2_K08
	3.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	LE, C	IS_K2_K01
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Teaching methods:

– lecture
– calculation class

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Schmidt L.D.: The Engineering of Chemical Reactions, Oxford University Press, New York 1998

[2] Fogler H.S., Thurnau A.F.: Essentials of Chemical Reaction Engineering, Prentice Hall, 2010

[3] Froment G.F. et al.: Chemical Reactor Analysis and Design, 3rd edition, John Wiley & Sons, 2010

[4] Davis M.E., Davis R. J.: Fundamentals of Chemical Reaction Engineering, McGraw-Hill, 2003

Additional references:

[1] Lecture notes and materials prepared by the teacher

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Head of the organizational unit **Dean of Mechanical Faculty**

(stemp/signature) ***(stemp/signature)***

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	FIRST

Course Title			Clean Fossil and Alternative Fuels				Basic Science (Y/N)	N
Tytuł przedmiotu			Czyste paliwa konwencjonalne i paliwa alternatywne					
ECTS points						Mode of complete the course	Course code	
Total	2	Cont.	1,2	Pract.		Coruse Credit	C.4.2.	
Preliminary requirements of the course		Name of course		Chemistry				
		Knowledge		1.	Student has extended and deepened knowledge of mathematics, physics, chemistry and other areas appropriate for the field of study useful for formulating and solving complex tasks related to the field of			
		Skills		1.	Student able to obtain information from the literature, databases and other properly selected sources in English or another foreign language recognized as the language of communication studies in terms of the international field of study.			
				2.	Student posseses a self-learning skills.			
		Social Competence		1.	Student is able to work both individually and in a team			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surmame)
Lecture	29	15	Associated Prof. Małgorzata Wzorek
Calculation class			
Labolatory class	29	15	Associated Prof. Małgorzata Wzorek
Project			
Seminar			
Total	58	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in classroom

Item	Content of course	Hours
1.	Characteristic of solid, gas and liquid fuels and their application in industry. Review of energy conversion technologies	3
2.	Coal chemistry, conversion and combustion	2
3.	Clean coal technologies	4
4.	Combustion and co-combustion of biomass	2
5.	Biofules. First- and next-generation biofuels. Advanced biofuels	2
6.	Synthetic fuels production and polygeneration systems	2

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Writing test to verify knowledge of the issues.		

LABORATORY CLASS	Execution method	Laboratory measurments	
Item	Content of course		Hours
1.	Introduction to the course. Samples preparation of diffrent type of fuels		2
2.	Analysis of physical properties of fuels (content of water, bulk density, particle size distribution, granulation		2
3.	Measurement of High Heating Value (HHV) of different types of fuels and calculation of LHV.		3
4.	Analysis of ash content		2
5.	Analysis of volatiles matter		2
6.	Mesurment of pollution emission during combustion 2 types of fuels		4
Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Test to verify knowledge of the issues. The report of performed measurements		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has specialized knowledge for solving problems related to environmental engineering	LE, LA	IS_K2_W13
	2.	Student demonstrates structured and theoretically underpinned basic knowledge which includes main issues of environmental engineering. Student has knowledge about role of environment, is aware of risks and knows methods of their identification and limitation.	LE, LA	IS_K2_W16
	3.	Student has current knowledge in the field of innovative technologies used in environmental engineering and related science disciplines, knows the principle of sustainable development.	LE, LA	IS_K2_W17
Skills	1.	Student is able to communicate in the range relating to environmental engineering using different techniques in various environments, also in a foreign language.	LE, LA	IS_K2_U05
	2.	Student can make a critical analysis of the functioning and evaluate the existing technical solutions used in environmental engineering.	LE, LA	IS_K2_U21
Social Competence	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	LE, LA	IS_K2_K01
	2.	Student uses intellectual achievements of other authors complying with copyright law in order to prepare scientific papers.	LE, LA	IS_K2_K02
	3.	Student can correctly identify engineering problems and is able to set priotities for professional activities.	LE, LA	IS_K2_K03

Teaching methods:

– lecture
– laboratory class

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Miller B.G: Clean Coal Engineering Technology, Butterworth-Heinemann, 2010

[2] Williams A. at al.: Combustin and Gasification of Coal, Taylor & Francis, 2000

[3] Patrick N., Hansen J.P., Lien J. R: Energy Technologies and Economics, Springer, 2012

Additional references:

[1] Weston K.C.: Energy Conversion. The Ebook (online at: www.personal.utulsa.edu/-kenneth-weston/)

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Head of the organizational unit
(stemp/signature)

Dean of Mechanical Faculty
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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Filed of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	FIRST

Course Title			Communication and Negotiations in Business				Basic Science (Y/N)	N
Tytuł przedmiotu			Komunikacja i negocjacje w biznesie					
ECTS points						Mode of complete the course	Course code	
Total	3	Cont.	1,2	Pract.		Coruse Credit	E.2.	
Preliminary requirements of the course		Name of course						
		Knowledge	1.	Student has the knowledge necessary to understand the social, economic, legal and other non-technical conditions of engineering activities.				
		Skills	1.	Student has a self-learning skills; working individually and in a team.				
		Social Competence	1.	Student can think and act in a creative, innovative and enterprising way.				

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	45	30	PhD Brygida Klemens
Calculation class			
Labolatory class			
Project			
Seminar			
Total	30	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in classroom

Item	Content of course	Hours
1.	General information about course	1
2.	Basic glossary	1
3.	Conflicts: conflict definition and conflict types, emotions in conflict, communications in conflict, conflict resolution methods	3
4.	What is communication? Communication act elements like: sender, addressee, announcement, channel, noise, feedback, effect	4
5	Verbal and nonverbal communication;	2
6	Good communication principles and good communication techniques. Accept criticism and commendation	4
7	What is negotiation? What kinds of negotiations do we have?	1
8	How to be good negotiator? The importance of first impression;	2
9	Negotiation strategies and negotiation process	2
9	The role of time	1

9	Negotiation techniques: difficult partner, part-power of attorney, illusory concession, delay technique, shocking offer, false shock, wolf in sheep's skin	6
9	Stress and techniques of its elimination; Relaxation methods	2
9	Test	1

Sudent's own study (h)	15	Contact hours per semester	30
Methods of checking intended learning outcomes	Students participation in classes, activity, paper work, test.		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has knowledge of methods, tools and models of environmental management including waste management.	LE	IS_K2_W08
	2.	Student has knowledge necessary to understand social, economical, legal and other non-technical conditions of engineering activities and their role in engineering practice.	LE	IS_K2_W20
	3.	Student knows and understands the basic concepts and rules for the protection of industrial property, copyright and necessity of intellectual property management, is able to use patent information resources.	LE	IS_K2_W21
Skills	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	LE	IS_K2_U01
	2.	Student has autonomous learning skills, works individually and in a team.	LE	IS_K2_U08
	3.	Student can make a preliminary economic analysis of engineering activities.	LE	IS_K2_U17
Social Competence	1.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	LE	IS_K2_K01
	2.	Student is able to interact and work in a group performing different roles; Student can uderstand the importance of collective action.	LE	IS_K2_K04
	3.	Student has awareness of the importance of professional behaviour, compliance with the principles of professional ethics and it can respect the diversity of views and opinions.	LE	IS_K2_K06

Teaching methods:

– lecture

Form of assessment:

Form:	Writing test
	activity
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Kennedy G.:, Essential Negotiation. An A-Z Guide, The Economist Newspaper, U.K. 2009

Cornelissen J.: Corporate Communication. A Guide to Theory and Practise, SAGE
[2] Publications, Singapore 2011
[3] Edelmann R.J.: Interpersonal conflicts at work, British Psychological Society, Leicester, 1993
[4] Cloke K., Goldsmith J.: Resolving conflicts at work, Jon Wileys and Sons, 2011

Additional references:

[1] Ury W.: Getting past no: negotiating your way from confrontation to cooperation, New York 1993
Fisher R., Ury W., Patton B.: Getting to yes. Negotiating agreement without giving in. Houghton Mifflin
[2] Harcourt, 1991
[3] Wood J.T.: Interpersonal Communication Everyday Encounters, Wadsworth, Boston 2013

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Head of the organizational unit	**Dean of Mechanical Faculty**
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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of study	Full-time studies
Semester	FIRST

Course Title		Computer Aided Design				Basic Science (Y/N)	N
Tytuł przedmiotu		Komputerowe Wspomaganie Projektowania					
ECTS points						Mode of complete the course	Course code
Total	3	Cont.	1,8	Pract.	2,4	Coruse Credit	A.5.
Preliminary requirements of the course		Name of course		Descriptive geometry, design			
		Knowledge		1.	Student knows the basic methods, techniques, tools and materials used in solving complex engineering tasks in the field of the studies field of study		
		Skills		1.	Student is able to obtain information from the literature, databases and other properly selected sources in English or another foreign language recognized as the language of communication studies in terms of the international field of study; it can integrate acquired information, it make their interpretation and critical evaluation, as well as to draw conclusions and formulate and fully justify opinions		
		Social Competence		1.	Student understands the need for lifelong learning, it can inspire and organize the process of other people learning		

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	29	15	PhD eng. Ronald Palwiczek
Calculation class			
Labolatory class			
Project	59	30	PhD eng. Ronald Palwiczek
Seminar			
Total	88	45	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lectures in classroom

Item	Content of course	Hours
1.	CAD software - Introduction to 2d drafting	1
2.	Standard CAD user interface, elements and operation	1
3.	Setting up a drawing, drawing format, units	1
4.	Coordinate system and methods for data entering	1
5.	Basic geometry: lines, rectangle, circle	1
6.	Working with layers, object handles, snap mode	2
7.	Basic operation: move, delete, rotate, copy, array of object	2
8.	Hatching and fillings areas	1
9.	Dimensioning, dimensional tolerances	2
10.	Basic of 3D modeling	2

11.	Printing			1
Sudent's own study (h)		14	Contact hours per semester	15
Methods of checking intended learning outcomes		Test		

PROJECT	Execution method	Realisation of selected tasks and individual project

Item	Content of course	Hours
1.	User interface: customisation and operation, definition of the drawing area - simple sketch	2
2.	Sketch exercise: simple structures and modyffications	2
3.	Sketch exercise: using handles, relations and snap mode	2
4.	Sketch exercise: hathing and dimensioning	2
5	Sketch excise: edition of the text, frames, titleblock	2
6	Draw project: drawing from sketch of the part	4
7	Draw project: drawing of the flat part	2
8	Draw project: drawing of the component "shaft" type	4
9	Draw project: drawing of the real machine's part	4
10.	Modeling exercise: simple 3d structure	2
11.	Modeling project: creation of 3d model of the selected part	4

Sudent's own study (h)	29	Contact hours per semester	30
Methods of checking intended learning outcomes	Individual project checking		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student knows numerical and computer methods and tools useful in solving engineering tasks in the field of environmental engineering.	LE, P	IS_K2_W06
	2.	Student knows the rules of engineering design and computer programmmes which support designing of environmental infrustructure.	P	IS_K2_W11
	3.	Student knows methods, techniques, tools and materials used in solving complex engineering tasks in the field of environmental engineering.	LE, P	IS_K2_W18
Skills	1.	Student uses computer programs to solve engineering tasks.	P	IS_K2_U4
	2.	Student can - in accordance with set specification - design and implement a simple device, object, system or process typical for environmental engineering using appropriate methods, techniques and tools.	P	IS_K2_U22
Social Competence	1.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	P	IS_K2_K01
	2.	Student has awareness of the importance of professional behaviour, compliance with the principles of professional ethics and it can respect the diversity of views and opinions.	LA, P	IS_K2_K06
	...			

Teaching methods:

– lecture
– project

Form of assessment:

Form:	
	Realisation of individual project.
Condi-tions:	**Course Credit + pass all parts of this subject**

Basic references:

[1] Alf Yarwood, Introduction to AutoCAD 2013, Routledge, 2013

Additional references:

[1]
[2]
[3]

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Head of the organizational unit *(stemp/signature)*	**Dean of Mechanical Faculty** *(stemp/signature)*

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	SECOND

Course Title		Creativity Training					Basic Science (Y/N)	N
Tytuł przedmiotu		Trening kreatywności						
ECTS points						Mode of complete the course	Course code	
Total	2	Cont.	1,2	Pract.		Exam	E.4.	
Preliminary requirements of the course		Name of course						
		Knowledge	1.	Student has the knowledge necessary to understand the social, economic, legal and other non-technical conditions of engineering activities.				
		Skills	1.	Student has a self-learning skills; working individually and in a team.				
		Social Competence	1.	Student can think and act in a creative, innovative and enterprising way.				

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	30	30	PhD Brygida Klemens
Calculation class			
Labolatory class			
Project			
Seminar			
Total	30	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	lecture classroom

Item	Content of course	Hours
1.	General information about course and creativity	1
2.	The brain: left and right brain functions and blocks the creativity	1
3.	A new paradigm of creativity	1
4.	Principles for encouraging creativity	1
5	The main techniques of creative thinking, for example: mind mapping; creative ABC technique; brainstorm; brainwriting; fish-bone technique; 635 technique; the six thinking hats; etc. – practical exercises,	9
6	Creative enterprise training, for example: disadvantage founding; new way of using products; 20 step methods.	4
7	Time management: life expectancy, the Pareto pronciple, time management principles, life goals, Gantt's graph, Eisenhower table,	4
8	Creativity in environmental engineering, for example: recycleart, waste using, CSR - practical exercises	8
9	Test	1

Sudent's own study (h)	30	Contact hours per semester	30
Methods of checking intended learning outcomes	Students participation in classes, activity, paper work, test.		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has knowledge of methods, tools and models of environmental management including waste management.	LE	IS_K2_W08
	2.	Student has knowledge necessary to understand social, economical, legal and other non-technical conditions of engineering activities and their role in engineering practice.	LE	IS_K2_W20
	3.	Student knows and understands the basic concepts and rules for the protection of industrial property, copyright and necessity of intellectual property management, is able to use patent information resources.	LE	IS_K2_W21
Skills	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	LE	IS_K2_U01
	2.	Student has autonomous learning skills, works individually and in a team.	LE	IS_K2_U08
	3.	Student can make a preliminary economic analysis of engineering activities.	LE	IS_K2_U17
Social Competence	1.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	LE	IS_K2_K01
	2.	Student is able to interact and work in a group performing different roles; Student can uderstand the importance of collective action.	LE	IS_K2_K04
	3.	Student has awareness of the importance of professional behaviour, compliance with the principles of professional ethics and it can respect the diversity of views and opinions.	LE	IS_K2_K06

Teaching methods:

– lecture

Form of assessment:

Form:	Writing test
	activity
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Buzan T.: The Memory Book, BBC Publications, 2010

[2] Florida, R.: The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life, Basic Books, 2002

Additional references:

[1] Van Goundy A.B.: 101 Activities for Teaching Creativity and Problem Solving, Pfeiffer 2005

[2] Amaratunga D., Jeong K.S.: Guide to creative thinking, critical thinking and problem solving skills, University of Salford, 2005

[3]

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Head of the organizational unit
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Dean of Mechanical Faculty
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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of study	Full-time studies
Semester	FIRST

Course Title		Data Bases and Advanced GIS				Basic Science (Y/N)	Y
Tytuł przedmiotu		Bazy danych i zaawansowany GIS					
ECTS points						Mode of complete the course	Course code
Total	3	Cont.	1,8	Pract.	2,4	Coruse Credit	A.6.
Preliminary requirements of the course		Name of course		GIS, Elements of informatics and computer techniques			
		Knowledge		1.	Bases of GIS		
		Skills		1.	Proficient computer skills		
				2.	Creates and edites vector layers in GIS program		
				3	Ability to perform basic attribute and spatial queries		
		Social Competence		1.	Notes the complexity of metadata documentation and databases		
				2.	It is persistent in the study of GIS and pogramming		

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	30	15	PhD eng. Jacek Wydrych
Calculation class			
Labolatory class	60	30	PhD eng. Jacek Wydrych
Project			
Seminar			
Total	90	45	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Slide presentations, Notes, Book

Item	Content of course	Hours
1.	Introduction, Relational Database Management	2
2.	Handling One to Many Relations, Subqueries and Complex Joins	2
3.	Zoning Variance Databases, Referential Integrity	3
4.	Introduction to GIS Modeling and Python, Python and Programming Basics	4
5.	GIS Data Access and Manipulation with Python	4

Sudent's own study (h)	15	Contact hours per semester	15
Methods of checking intended learning outcomes	Middle and final tests		

LABORATORY CLASS	Execution method	Practice in computer laboratory

Item	Content of course	Hours
1.	Database Design	5
2.	ZONING / ZONING table / ZONING database	5
3.	Programming Basics in Python	10
4.	Practical Python for the GIS Analyst	10

Sudent's own study (h)	30	Contact hours per semester	30
Methods of checking intended learning outcomes	GIS databases and reports of working the bases, Python GIS subroutine and report of working the subroutine		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student knows statistical methods of data analysis and measurement results development.	LE, LA	IS_K2_W05
	2.	Student has current knowledge in the field of innovative technologies used in environmental engineering and related science disciplines, knows the principle of sustainable development.	LE	IS_K2_W17
Skills	1.	Student can use statistical methods in data development and environmental analysis.	LA	IS_K2_U03
	2.	Student uses computer programs to solve engineering tasks.	LA	IS_K2_U04
Social Competence	1.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	LE,LA	IS_K2_K01
	2.	Student can think and act in a creative, innovative and entrepreneurial way.	LE,LA	IS_K2_K07
	3.	Student can understand the social role of an negineer and can understand the need for reliable public information about the achievements of engineering.	LE,LA	IS_K2_K08
	...			

Teaching methods:

– lecture
– laboratory class

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Python Geospatial Development, Erik Westra, PACKT, 2013
[2] Spatial databases with application to GIS, Philippe Rigaux, Morgan Kaufmann Publishers Inc., 2002

Additional references:

[1] GIS. Teoria i praktyka, Paul A. Longley, Wydawnictwo Naukowe PWN, 2008

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Head of the organizational unit
(stemp/signature)

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Dean of Mechanical Faculty
(stemp/signature)

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of study	Full-time studies
Semester	THIRD

Course Title		Diploma seminar					Basic Science (Y/N)	N
Tytuł przedmiotu		Seminarium dyplomowe						
ECTS points						Mode of complete the course	Course code	
Total	1	Cont.	0,6	Pract.		Coruse Credit	C.5.	
Preliminary requirements of the course		Name of course		All courses in ATEE specialization				
		Knowledge		1.	Student has knowledge of the processes and phenomena in environmental engineering.			
				2.	Student has knowledge of processes and phenomena modeling in the field of engineering environment.			
				3.	Student has knowledge of modeling and design in the field of engineering environment.			
		Skills		1.	Student is able to obtain information from the literature, databases and other properly selected sources in English or another foreign language recognized as the language of communication studies in terms of the international field of study; it can integrate acquired information, it make their interpretation and critical evaluation, as well as to draw conclusions and formulate and fully justify opinions.			
				2.	Student is able to prepare a presentation about diffrent topics i problems of environmental engineering.			
		Social Competence		1.	Student understands the need for lifelong learning, it can inspire and organize the process of other people learning.			
				2.	Student is aware of and understands the validity of the non-technical aspects and effects of engineering activities, including its impact on the environment, and the associated responsibility for decisions.			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture			
Calculation class			
Labolatory class			
Project			
Seminar	29	15	Associated Prof. Gabriel Filipczak
Total	29	15	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

SEMINAR	Execution method	Oral presentations

Item	Content of course	Hours
1.	Requirements for the form, scope and content of the Master's thesis	2
2.	Presentation of the thesis topics, and progress of work implementation	5
3.	Repetition of the scope of courses materials	8

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Evaluation of presented oral presentations		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has broadened and deepened knowledge of selected fields of mathematics, physics, chemistry, biology and earth science in terms necessary to describe phenomena and processes related to environmental engineering technology.	S	IS_K2_W01
	2.	Student has knowledge of process, phenomena and device modeling in environmental engineering.	S	IS_K2_W07
	3.	Student knows the designing rules of devices and equipment used in environmental engineering and is familiar with development	S	IS_K2_W10
Skills	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	S	IS_K2_U01
	2.	Student can prepare in Polish and in a foreign language, considered as basic, a set problem of environmental engineering.	S	IS_K2_U06
	3.	Student is able to prepare and present in Polish and in a foreign language, considered as basic, an oral presentation of detailed engineering issues.	S	IS_K2_U07
Social Competence	1.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	S	IS_K2_K01
	2.	Student can think and act in a creative, innovative and entrepreneurial way.	S	IS_K2_K03
	...			

Teaching methods:

– seminar

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Literature affiliated with Master's theses topics
[2] Recommended literature connected with studied courses

Additional references:

[1] Master's theses realized in previous years

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Head of the organizational unit	**Dean of Mechanical Faculty**
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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	FIRST

Course Title			Energy Analysis and Feasibility Studies			Basic Science (Y/N)	N
Tytuł przedmiotu			Analizy energetyczne i studia wykonalności				
ECTS points						Mode of complete the course	Course code
Total	2	Cont.	1,2	Pract.	1,2	Coruse Credit	C.4.1.
Preliminary requirements of the course		Name of course		Mathematics, Physics, Chemistry, Energy obtaining techniques			
		Knowledge		1.	Student knows first and second low of thermodynamics		
		Skills		1.	Student is able to make basic mass and energy balances as well as derive basic energy quantities		
				2.	Student posseses a self-learning skills and is able to work both individually and in a team		
		Social Competence		1.	Student correctly identifies engineering problems as well as economic issues of energy conversion cases		

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	25	15	PhD eng. Mariusz Tańczuk
Calculation class			
Labolatory class			
Project	29	15	PhD eng. Mariusz Tańczuk
Seminar			
Total	54	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in classroom

Item	Content of course	Hours
1.	General classification of energy conversion technologies	3
2.	Technical description of small scale and large scale cases heat and power plants	3
3.	Methodology of technical and economic analysis - a review	3
4.	Discounted method of profitability calculation	3
5.	Feasibiity study cases	3

Sudent's own study (h)	10	Contact hours per semester	15
Methods of checking intended learning outcomes	Writing exam. Test to verify knowledge of the issues.		

PROJECT	Execution method	Individual work in classroom

Item	Content of course	Hours
1.	Introduction to project cases and discusion on initial date to project cases as well as on calculation alghoritm	3
2.	Preparing calculation spreadshit and making analysis	9
3.	Team discussion of the results	3

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Individual project checking		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has knowledge of conventional and alternative energy sources and of technical and technological possibilities of generating, converting and application.	LE, P	IS_K2_W04
	2.	Student knows numerical and computer methods and tools useful in solving engineering tasks in the field of environmental engineering.	LE, P	IS_K2_W06
	3.	Student has knowledge of preparation and application of investment documentation, organization of construction and installation works.	LE, P	IS_K2_W09
	4.	Student knows the principles of processes, objects and systems of environmental engineering systems design, including their influence on the environment, reliability and safety of use.	LE	IS_K2_W14
Skills	1.	Student can recognize the system and non-technical aspects during formulating and solving engineering tasks.	LE, P	IS_K2_U15
	2.	Student can use the investment documentation, evaluate the costs of investment, apply the priciples of the organization of installation	LE, P	IS_K2_U16
	3.	Student can make a preliminary economic analysis of engineering activities.	LE, P	IS_K2_U17
	4.	Student can prepare in Polish and in a foreign language, considered as basic, a set problem of environmental engineering.		IS_K2_U06
Social Competence	1.	Student can understand the importance of necessity to provide safe working environment.	LE, P	IS_K2_K02
	2.	Student can correctly identify engineering problems and is able to set priotities for professional activities.	LE, P	IS_K2_K03
	3.	Student is aware of the importance and it can understand the non-technical aspects and effects of engineering actions, including their impact on the environment, and the associated responsibility for decisions.	LE, P	IS_K2_K05
	...			

Teaching methods:

– lecture
– project

Form of assessment:

Form:	Writing exam
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Steve Doty, Wayne C. Turner: Energy Management Handbook. Seventh Edition. CRC Press 2009
[2] Thollander Patrik, Palm Jenny: Improving Energy Efficiency in Industrial Energy Systems. Springer 2013.
[3] Narbel Patrick, Hansen Jan Petter, Lien Jan R.: Energy Technologies and Economics. Springer, 2012

Additional references:

[1] Energy Conversion and Management. An International Journal. Elsevier

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Head of the organizational unit
(stemp/signature)

Dean of Mechanical Faculty
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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Filed of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	SECOND

Course Title			Energy consumption of industrial processes				Basic Science (Y/N)	N
Tytuł przedmiotu			Energochłonność procesów przemysłowych					
ECTS points						Mode of complete the course	Course code	
Total	2	Cont.	1,2	Pract.		Coruse Credit	E.5.	
Preliminary requirements of the course		Name of course						
		Knowledge	1.	Student has good knowledge about thermodynamics.				
			2.	Student has basic knowledge about energy conversion processes.				
		Skills	1.	Student can consult the catalogues of devices.				
			2.	The student can use the reports and statistics concerning energy consumption.				
		Social Competence	1.	Student is competent in creative thinking.				
			2.	Student is competent to ability to cooperate.				

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surmame)
Lecture	30	15	PhD eng. Daniel Zając
Calculation class	25	15	
Laboratory class			
Project			PhD eng. Daniel Zając
Seminar			
Total	55	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in audition room

Item	Content of course	Hours
1.	Energy efficiency - review of EU law regulation	1
2.	Definition of energy and material consumption	1
3.	Direct and cumulative energy consumption and calculation methods	2
4.	The impact of organization of the manufacturing process on energy and material consumption of the product	1
5.	Technological, constructional and exploatation energy and material consumption -and their dependance on technology, construction and exploatation process	1
6.	Basic concepts of energy management	2
7.	Rationalization of the use of energy	2
8.	Energy-saving equipment in industry	2
9.	Directions and potential energy efficiency in electricity demand management, integrated planning	1
10.	Energy efficiency audit	2

Sudent's own study (h)	15	Contact hours per semester	15

Methods of checking intended learning outcomes	Written test

CALCULATION CLASS	Execution method	Calculation

Item	Content of course	Hours
1.	Exercise content is associated with the content of the lectures and includes the calculation of the energy and material consumption of selected production processes	15

Sudent's own study (h)	10	Contact hours per semester	15

Methods of checking intended learning outcomes	Tasks of checking the knowledge

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has broadened and deepened knowledge of selected fields of mathematics, physics, chemistry, biology and earth science in terms necessary to describe phenomena and processes related to environmental engineering technology.	LE, C	IS_K2_W01
	2.	Student has knowledge of conventional and alternative energy sources and of technical and technological possibilities of generating, converting and application.	LE, C	IS_K2_W04
Skills	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	LE, C	IS_K2_U01
	2.	Student can perform simple tasks concerning broadly defined environmental protection technologies.	LE, C	IS_K2_U20
	3.	Student evaluates the processes, equipment, objects and systems related to environmental engineering in terms of their energy and economic efficiency and their influence on the environment.	LE, C	IS_K2_U23
Social Competence	1.	Student can correctly identify engineering problems and is able to set priotities for professional activities.	LE, C	IS_K2_K03
	2.	Student is aware of the importance and it can understand the non-technical aspects and effects of engineering actions, including their impact on the environment, and the associated responsibility for decisions.	LE, C	IS_K2_K05
	...			

Teaching methods:

– lecture
– calculation class

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Bähre D., Swat M., Steuer P. : Trapp in Sustainable Manufacturing, 2012

Additional references:

[1] Advanced Product and Process Design Through Methodological Analysis and Forecasting of Energy Consumption in Manufacturing

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Head of the organizational unit
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Dean of Mechanical Faculty
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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Filed of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	FIRST

Course Title		Environmental Analytics					Basic Science (Y/N)	N
Tytuł przedmiotu		Analityka środowiskowa						
ECTS points						Mode of complete the course	Course code	
Total	2	Cont.	1	Pract.	1,2	Coruse Credit	B.4.	
Preliminary requirements of the course		Name of course		Chemistry				
		Knowledge		1.	Student has extended and deepened knowledge of mathematics, physics, chemistry and other areas appropriate for the field of study useful for formulating and solving complex tasks related to the field of study.			
				2.	Student has detailed knowledge of the fields of study related with the studied field of study.			
		Skills		1.	Student is able to obtain information from the literature, databases and other properly selected sources in English.			
				2.	Student is able to plan and carry out experiments, inrpret the results and draw conclusions.			
		Social Competence		1.	Student understands the need for the lifelong leraning.			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	29	15	PhD eng. Joanna Guziałowska-Tic
Calculation class			
Labolatory class	29	15	PhD eng. Joanna Guziałowska-Tic
Project			
Seminar			
Total	58	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in the classroom

Item	Content of course	Hours
1.	Nature and importance of chemical and environmental analytics	1
2.	Major categories of chemical analytics	1
3.	Error and treatment of data	1
4.	Gravimetric Analytics	1
5.	Volumetric Analytics: Titration	1
6.	Spectrophotometric methods	1
7.	Electrochemical methods of analytics	1
8.	Chromatography	1
9.	Mass Spectrometry	1
10.	Automates analyses	1

11.	Classical methods of water analytics	1
12.	Instrumental methods of water analytics	1
13.	Environmental analytics of wastes	1
14.	Environmental analytics of solids	1
15.	Methods of air pollutants analytics	1

Sudent's own study (h)	14	Contact hours per semester	15

Methods of checking intended learning outcomes	Writing test

LABORATORY CLASS	Execution method	Laboratory analyses

Item		
	WHS in the laboratory of environmental analytics. Getting acquainted with the principles of using research apparatus	1
1.	Volumetric Analytics: Titration	2
2.	Electrochemical methods of analytics	2
3.	Mineralization of waste samples for determination of heavy metals	1
4.	Analyses of heavy metals in wastes using ASA method	2
5.	Chromatography method of organics matter identification in water	4
6.	Spectrophotometric method of nitogen components identification	4

Sudent's own study (h)	14	Contact hours per semester	15

Methods of checking intended learning outcomes	Checking knowledge before entering the class - tests and reports execution

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has broadened and deepened knowledge of selected fields of mathematics, physics, chemistry, biology and earth science in terms necessary to describe phenomena and processes related to environmental engineering technology.	LE	IS_K2_W01
	2.	Student knows methods, techniques and equipment for analyzing physical, chemical and biological phenomena from the perspective of engineering and environmental protection, has basic knowledge of life cycle of equipment, objects and technical systems.	LA	IS_K2_W15
	3.	Student demonstrates structured and theoretically underpinned basic knowledge which includes main issues of environmental engineering. Student has knowledge about role of environment, is aware of risks and knows methods of their identification and limitation.	LE	IS_K2_W16
Skills	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	LE	IS_K2_U01
	2.	Student can use statistical methods in data development and environmental analysis.	LA	IS_K2_U03
	3.	Student has the skills of phenomena and process observation and is able to do experimental measurements of characteristic physical,chemical and biological quantities relevant to environmental engineering and to interpret the results.	LA	IS_K2_U18
Social Competence	1.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	LE	IS_K2_K01
	2.	Student can understand the importance of necessity to provide safe working environment.	LA	IS_K2_K02
	...			

Teaching methods:

– lecture
– laboratory class

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Reeve R.N.: Introduction to environmental analysis, John Wiley & Sons, 2002
[2] Radojevic M., Bashkin V.: Practical environmental analysis, Royal Society of Chemistry, 1999

Additional references:

[1] Manahan S.E.: "Frontmatter" Foundamentals of environmental chemistry, Boca Raton, CRC Press, LLC,

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Head of the organizational unit
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Dean of Mechanical Faculty
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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of study	Full-time studies
Semester	SECOND

Course Title			Environmental Fluid Transport				Basic Science (Y/N)	N
Tytuł przedmiotu			Transport płynów w Inżynierii Środowiska					
ECTS points						Mode of complete the course	Course code	
Total	3	Cont.	1,8	Pract.	2,3	Coruse Credit	C.2.2.	
Preliminary requirements of the course		Name of course	Matematics, Phisics, Fluid Mechanics					
		Knowledge	1.	It has knowledge of selected fields of mathematics, physics, Fluid				
		Skills	1.	It can uses computer programs to solve engineering tasks				
		Social Competence	1.	It can correctly identify engineering problems and it is able to set priotity of professional activities				

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surmame)
Lecture	30	15	PhD eng. Grzegorz Borsuk
Calculation class			
Labolatory class	29	15	PhD eng. Grzegorz Borsuk
Project	29	15	PhD eng. Grzegorz Borsuk
Seminar			
Total	88	45	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lectures in classoom

Item	Content of course	Hours
1.	Problems of pneumatic and hydraulic transport	1
2.	Continuity equation and the equation of ideal and real gas motion	2
3.	Solid particles movement in e centrifugal force field	2
4.	Falling of solid particles in the gas and liquid, sedimentation	2
5.	Gas bubbles movement in a liquid, aeration and aerators	2
6.	Fundamentals of the fluidization	2
7.	Fluid flow through porous media	2
8.	Fitration	2

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Course credit - test		

LABORATORY CLASS	Execution method	Laboratory exercises

Item	Content of course	Hours
1.	General priciples of the classes and health and safety regulations	1
2.	Measuring using orifice	2
3.	Pressure and energy lines during flow through pipe systems	2
4.	The fluid velocity profile in the chanel flow	2

5.	Measuring of the ejector	2
6.	Flow through the porous bed	2
7.	The outflow of fluid from the tank	2
8.	Measuring of the flow in open channel	2

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Reports from the measurements		

PROJECT	Execution method	Practical calculation

Item	Content of course	Hours
1.	Calculation of the serial-parallel flow systems	15

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Evaluation of the calculation results		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has broadened and deepened knowledge of selected fields of mathematics, physics, chemistry, biology and earth science in terms necessary to describe phenomena and processes related to environmental engineering technology.	LE,LA	IS_K2_W01
	2.	Student knows statistical methods of data analysis and measurement results development.	LE, LA	IS_K2_W05
	3.	Student knows numerical and computer methods and tools useful in solving engineering tasks in the field of environmental	LE, LA	IS_K2_W06
Skills	1.	Student can use statistical methods in data development and environmental analysis.	LE, LA	IS_K2_U03
	2.	Student uses computer programs to solve engineering tasks.	LE, LA, P	IS_K2_U04
	3.	Student can use the measurement devices, is able to estimate errors.	LE, LA	IS_K2_U13
Social Competence	1.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	LE, LA	IS_K2_K01
	2.	Student is able to interact and work in a group performing different roles; Student can uderstand the importance of collective action.	LE, LA, P	IS_K2_K04
	3.	Student can think and act in a creative, innovative way.	LE, LA	IS_K2_K07
	...			

Teaching methods:

– lecture
– laboratory class
– project

Form of assessment:

Form:	Writing exam
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Mills D., Jones M., Agarwal V.: Handbook of Pneumatic Conveying Engineering, CRC Press, 2004
[2] Klinzing, G.E., Rizk, F., Marcus, R., Leung, L.S.: Pneumatic Conveying of Solids, Springer, 2010

Additional references:

[1] Bergander M.: Fluid Mechanics, Applications, vol. 2, AGH, 2010

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Head of the organizational unit
(stemp/signature)

Dean of Mechanical Faculty
(stemp/signature)

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of study	Full-time studies
Semester	FIRST

Course Title		Environmental Statistics				Basic Science (Y/N)	N
Tytuł przedmiotu		Statystyka w Inżynierii Środowiska					
ECTS points						Mode of complete the course	Course code
Total	2	Cont.	1,2	Pract.	1,2	Coruse Credit	A.1.
Preliminary requirements of the course		Name of course		Matematics, physics			
		Knowledge		1.	Student has knowledge of selected fields of mathematics and physics to extent necessary to describe phenomena and processes related to environmental engineering technology.		
		Skills		1.	Student can use computer programs to solve engineering tasks		
		Social Competence		1.	Student can correctly identify engineering problems and it is able to set priotity of professional activities		

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surmame)
Lecture	30	15	PhD eng. Grzegorz Borsuk
Calculation class			
Labolatory class	30	15	PhD eng. Grzegorz Borsuk
Project			
Seminar			
Total	60	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lectures in classroom

Item	Content of course	Hours
1.	Methods of statistics in environmental engineering	1
2.	Presentation of the basic tools of decriptive statistics	2
3.	Statistical arean, sufficient statistics and statistical information	2
4.	Schemes and methods of statistical inference	2
5.	The point estimate, mean square error, variance of the estimator	2
6.	Interval estimation of the sample.	2
7.	Hypothesis testing and construction of the essential tests	2
8.	Model of linear and multiple regression, diagnostics and testing	2

Sudent's own study (h)	15	Contact hours per semester	15
Methods of checking intended learning outcomes	Writting test		

LABORATORY CLASS	Execution method	Laboratory exercises in computer class

Item	Content of course	Hours
1.	Basic calculation of sample measurements results	3
2.	Preparing histograms, bar charts, average, median, variance and sampling quantile	3

3.	Stastistical construction space, the concept of a simple random sample	3
4.	The average properties of a sample and proportion, the point estimate	3
5.	Interval estimation, confidence interval for the mean, variance and mean difference	3

Sudent's own study (h)	15	Contact hours per semester	15
Methods of checking intended learning outcomes	Reports from the calculations		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has broadened and deepened knowledge of selected fields of mathematics, physics, chemistry, biology and earth science in terms necessary to describe phenomena and processes related to environmental engineering technology.	LE, LA	IS_K2_W01
	2.	Student knows statistical methods of data analysis and measurement results development.	LE, LA	IS_K2_W05
	3.	Student knows methods, techniques, tools and materials used in solving complex engineering tasks in the field of environmental engineering.	LE, LA	IS_K2_W18
Skills	1.	Student can use statistical methods in data development and environmental analysis.	LE, LA	IS_K2_U03
	2.	Student uses computer programs to solve engineering tasks.	LE, LA	IS_K2_U04
	3.	Student is able to plan and carry out experiments, to interpret the results and to draw conclusions.	LE, LA	IS_K2_U12
Social Competence	1.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	LE, LA	IS_K2_K01
	2.	Student is able to interact and work in a group performing different roles; Student can uderstand the importance of collective action.	LE, LA	IS_K2_K04
	3.	Student can think and act in a creative, innovative and entrepreneurial way.	LE, LA	IS_K2_K07
	...			

Teaching methods:

– lecture
– laboratory class

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Springer handbook of engineering statistics, Susan L. Albin et al., Springer, 2006.
[2] Statistical Theory and Modeling for Turbulent Flows, Durbin, B. A. Pettersson R., John Wiley & Sons, 2001

Additional references:

[1] Statistical procedures for engineering, management, and science, Leland Blank, McGraw-Hill Book Co.,

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Head of the organizational unit
(stemp/signature)

Dean of Mechanical Faculty
(stemp/signature)

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	SECOND

Course Title		Ethics in Business					Basic Science (Y/N)	N
Tytuł przedmiotu		Etyka biznesu						
ECTS points						Mode of complete the course	Course code	
Total	2	Cont.	1,2	Pract.		Coruse Credit	E.3.	
Preliminary requirements of the course		Name of course						
		Knowledge	1.	Student has the knowledge necessary to understand the social, economic, legal and other non-technical conditions of engineering activities.				
		Skills	1.	Student has a self-learning skills; working individually and in a team.				
		Social Competence	1.	Student can think and act in a creative, innovative and enterprising way.				

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	45	30	Associated Prof. Leszek Karczewski
Calculation class			
Labolatory class			
Project			
Seminar			
Total	45	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lectures in classroom

Item	Content of course	Hours
1.	Introduction - Ethics - basic concepts	2
2.	Business and Business Ethics	2
3.	Corporate Social Responsibility CSR - basic concepts	2
4.	Ethical standards of Corporate Social Responsibility	2
5.	Codes of ethics and ethical programmes of companies	2
6.	Cultural determinants of wealth creation and business ethics	2
7.	Ethics of personal management	2
8.	Ethics of marketing and marketing research	2
9.	Ethics in advertising and PR	2
10.	Pathologies in business - corruption, mobbing, harassment	2
11.	Etics and TQM and ethical leadership	2
12.	Ethical leadership	2
13.	Selected models of decision making in Business Ethics	2
14.	Consumer ethics	2
15.	Summary	2

Sudent's own study (h)	15	Contact hours per semester	30
Methods of checking intended learning outcomes	Test		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student can perform simple tasks concerning broadly defined environmental protection technologies.	LA	IS_K2_W20
Skills	1.	Student has autonomous learning skills, works individually and in a team.	LA	IS_K2_U08
Social Competence	1.	Student is aware of the importance and it can understand the non-technical aspects and effects of engineering actions, including their impact on the environment, and the associated responsibility for decisions.	LA	IS_K2_K05
	2.	Student can understand the importance of necessity to provide safe working environment.	LA	IS_K2_K02
	...			

Teaching methods:

– lecture

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Klopfer,M.: Teaching Module Business Ethics, Extract, 1994.

[2] Brown M.: The Ethical Process. A strategy for Making Good Decissions, Prentice Hall, Upper Saddle River, New Jersey, USA, 1996

[3] Smith N.C., Lenssen G.: Mainstreaming Corporate Responsibility, John Willey&Sons Ltd.The Atrium, South Gate, Chichester, West Sussex, England, 2009

[4] Moorthy R.S., De George R. T.: Uncompromising Integrity: Motorola's Global Challenge, Universal Press, USA, 1998

[5] Karczewski L. (ed.): Cultural, Social and Ethcal Determinants of Economy, Business and Ethics, Opole,

Additional references:

[1] Griffin R.: Management, All editions, Hoghton Miffin Company.

[2] Hampden-Turner Ch.A., Trompenaars A.: The Seven Cultures of Capitalism, Doubleday Publishing Group Inc, 1993

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Head of the organizational unit
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Dean of Mechanical Faculty
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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of study	Full-time studies
Semester	FIRST

Course Title		Heat and Mass Transfer Processes Design				Basic Science (Y/N)	N
Tytuł przedmiotu		Projektowanie procesów wymiany ciepła i masy					
ECTS points						Mode of complete the course	Course code
Total	3	Cont.	2,4	Pract.	1,2	Exam	B.1.
Preliminary requirements of the course		Name of course					
		Knowledge	1.	Student has basic knowledge about the environmental chemistry.			
			2.	Student has basic knowledge of the design and production process.			
		Skills	1.	Student can establish of physical properties of substances.			
			2.	Student can consult the catalogues of devices.			
		Social Competence	1.	Student is competent in creative thinking.			
			2.	Student is competent to ability to cooperate.			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surmame)
Lecture	59	30	PhD eng. Małgorzata Płaczek/PhD eng. Marcin Pietrzak
Calculation class	29	15	PhD eng. Małgorzata Płaczek
Labolatory class			
Project	29	15	PhD eng. Marcin Pietrzak
Seminar			
Total	117	60	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in auditorium room

Item	Content of course	Hours
1.	Define various modes of heat transfer	2
2.	Conduction (the mathematical representations of their rates of transfer)	2
3.	The convection equation. Flow equations and boundary layer	2
4.	Forced convection relations	2
5.	Natural convection	2
6.	Radiation	2
7.	Heat exchangers. The overall heat transfer coefficient	2
8.	Condensation and Boiling.	2
9.	Define various modes of mass transfer	2
10.	Diffusivity estimation for gases	2
11.	Diffusivity estimation for liquids	2
12.	Mass transfer coefficients in a tray column	2
13.	Mass transfer coefficients in a packed tower	2
14.	Compare heat and mass transfer mechanisms and describe their analogies	2
15.	Selection of heat and mass exchangers. General design procedure	2

Sudent's own study (h)	29	Contact hours per semester	30
Methods of checking intended learning outcomes	Exam		

CALCULATION CLASS	Execution method	Calculations

Item	Content of course	Hours
1.	Calculate thermal conductivity	1
2.	Calculate heat transfer by forced convection	2
3.	Calculate heat transfer by natural convection	2
4.	Calculate overall heat transfer coefficient and heat transfer area of heat exchangers	2
5.	Calculate diffusion coefficients for gases	2
6.	Calculate diffusion coefficients for liquids	2
7.	Calculate mass balance for other columns	2
8.	Calculate overall mass transfer coefficient and mass transfer area of mass exchangers	2

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Test		

PROJECT	Execution method	Computation problems of design work

Item	Content of course	Hours
	Design of humidification system which include:	
1.	Calulation of fluid properties	1
2.	Determination of steam condenser (heat exchange surface, selection of construction solution, choice of gas connecting elements and ellipsoidal bottoms).	2
3.	Determination of scrubber (diameter, height of rings layer, allowable gas flow rate, hold up of liquid suspended in scrubber, choice of gas connecting elements and ellipsoidal bottom, type of sprinkler and water drops separator)	2
4.	Determination of pipelines (lenght of pipes, pipe diameters, control valves).	2
5.	Calculation of pressure drops	2
6.	Determination of buffer tank (volume and size of tank)	2
7.	Determination of water pump (working point of pump-operating characteristic, select of pump type)	2
8.	Drawing of installation	2

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Verbal and written clearing of effects of individual project work implementation		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student knows the designing rules of devices and equipment used in environmental engineering and is familiar with development trends in construction of environmental protection installations.	LE,C,P	IS_K2_W10
	2.	Student knows the rules of engineering design and computer programmmes which support designing of environmental infrustructure.	LE,C,P	IS_K2_W11
	3.	Student knows methods, techniques, tools and materials used in solving complex engineering tasks in the field of environmental engineering.	LE,C,P	IS_K2_W18
Skills	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	LE,C,P	IS_K2_U01
	2.	Student is able to carry out the analysis of engineering tasks and apply simulation methods leading to the solution, interpret the results, draw conclusions and test the hypothesis.	LE,C,P	IS_K2_U14

	3.	Student can - in accordance with set specification - design and implement a simple device, object, system or process typical for environmental engineering using appropriate methods, techniques	LE,C,P	IS_K2_U22
Social Competence	1.	Student can correctly identify engineering problems and is able to set priotities for professional activities.	LE,C,P	IS_K2_K03
	2.	Student is able to interact and work in a group performing different roles; Student can uderstand the importance of collective action.	LE,C,P	IS_K2_K04
	3.	Student can think and act in a creative, innovative and entrepreneurial way.	LE,C,P	IS_K2_K07
	...			

Teaching methods:

– lecture
– calculation class
– project

Form of assessment:

Form:	Writing exam
Condi-tions:	Exam - pass all parts of this subject and positive note from the test

Basic references:

Kreith F., Boehm R.F., et. al.: Heat and Mass Transfer. Mechanical Engineering Handbook. Ed. Frank Kreith. Boca Raton: CRC Press LLC, 1999.

[1]

[2] Markoš J.: Mass Transfer in Chemical Engineering Processes. InTech, 2011.

Cengel Y.A., Ghajar A.J.: Heat and Mass Transfer: Fundamentals & Applications. Fourth Edition. McGraw-

[3] Hill, 2011.

[4] Sukhatme S.P.: A Textbook on Heat Transfer. Fourth Edition. Universities Press (India), 2005.

Additional references:

[1] Lienhard J.H.: A Heat Transfer Textbook. Third edition. Phlogiston Press, 2002.

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Head of the organizational unit
(stemp/signature)

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Dean of Mechanical Faculty
(stemp/signature)

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	SECOND

Course Title		Mass exchanger design				Basic Science (Y/N)	N
Tytuł przedmiotu		Projekt wymiennika masy					
ECTS points						Mode of complete the course	Course code
Total	2	Cont.	1,2	Pract.	1,2	Coruse Credit	E.7.
Preliminary requirements of the course		Name of course					
		Knowledge		1.	Student has knowledge about the heat and mass transfer processes.		
				2.	Student has basic knowledge of the design and production process.		
		Skills		1.	Student can establish of physical properties of substances.		
				2.	Student can consult the catalogues of devices.		
		Social Competence		1.	Student is competent in creative thinking.		
				2.	Student is competent to ability to cooperate.		

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surmame)
Lecture	29	15	PhD eng. Marcin Pietrzak
Calculation class			
Labolatory class			
Project	29	15	PhD eng. Marcin Pietrzak
Seminar			
Total	58	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in auditorium room

Item	Content of course	Hours
1.	Introduce and definitions	1
2.	Types of mass transfer columns	2
3.	Mass balance	2
4.	Equilibrium data and diagrams. Use of operating curve	2
5.	Calculation of transfer units	2
6.	Computation of diameter and column height	2
7.	General design procedure. Requirements	2
8.	Selection of equipment	2

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Test		

PROJECT	Execution method	Computation problems of design work

Item	Content of course	Hours
	Absorption column design which include:	
1.	The gas mixture composition in molar fractions	1

2.	The volume flow rate of gas phase components	2
3.	The properties of gas components	2
4.	The graph of concentrations	2
5.	The mass balance	2
6.	The average module of process	2
7.	Determination of the absorber diameter	2
8.	Determination of the absorber area	2

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Assesment of individual project work		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student knows the designing rules of devices and equipment used in environmental engineering and is familiar with development trends in construction of environmental protection installations.	LE,P	IS_K2_W10
	2.	Student knows the rules of engineering design and computer programmmes which support designing of environmental infrustructure.	LE,P	IS_K2_W11
	3.	Student knows methods, techniques, tools and materials used in solving complex engineering tasks in the field of environmental engineering.	LE,P	IS_K2_W18
Skills	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	LE,P	IS_K2_U01
	2.	Student is able to carry out the analysis of engineering tasks and apply simulation methods leading to the solution, interpret the results, draw conclusions and test the hypothesis.	LE,P	IS_K2_U14
	3.	Student can - in accordance with set specification - design and implement a simple device, object, system or process typical for environmental engineering using appropriate methods, techniques and tools.	LE,P	IS_K2_U22
Social Competence	1.	Student can correctly identify engineering problems and is able to set priotities for professional activities.	LE,P	IS_K2_K03
	2.	Student is able to interact and work in a group performing different roles; Student can uderstand the importance of collective action.	LE,P	IS_K2_K04
	3.	Student can think and act in a creative, innovative and entrepreneurial way.	LE,P	IS_K2_K07
	...			

Teaching methods:

– lecture
– project

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

Kreith F., Boehm R.F., et. al.: Heat and Mass Transfer. Mechanical Engineering Handbook. Ed. Frank Kreith. Boca Raton: CRC Press LLC, 1999.

[1]

[2] Markoš J.: Mass Transfer in Chemical Engineering Processes. InTech, 2011.

[3] Cengel Y.A., Ghajar A.J.: Heat and Mass Transfer: Fundamentals & Applications. Fourth Edition. McGraw-Hill, 2011.

Additional references:

[1] Lienhard J.H.: A Heat Transfer Textbook. Third edition. Phlogiston Press, 2002.

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Head of the organizational unit
(stemp/signature)

Dean of Mechanical Faculty
(stemp/signature)

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	SECOND

Course Title		Material Reuse Technologies					Basic Science (Y/N)	N
Tytuł przedmiotu		Technologie odzysku materiałowego						
ECTS points						Mode of complete the course	Course code	
Total	2	Cont.	1,2	Pract.		Exam	C.3.1.	
Preliminary requirements of the course		Name of course		Physics, chemistry, waste management				
		Knowledge	1.	Student has extended and deepened knowledge of mathematics, physics, chemistry and other areas appropriate for the field of study useful for formulating and solving complex tasks related to the field of study				
			2.	Student has knowledge of development trends and the most important new developments in the field of science and scientific disciplines relevant to the studied field of study and related disciplines				
		Skills	1.	Student able to obtain information from the literature, databases and other properly selected sources in English or another foreign language recognized as the language of communication studies in terms of the international field of study; it can integrate acquired information, it make their interpretation and critical evaluation, as well as to draw conclusions and formulate and fully justify opinions				
			2.	It can communicate using a variety of techniques in the workplace and in other environments, also in English or another foreign language recognized as a international communication language in the field of				
		Social Competence	1.	Student understands the need for lifelong learning, it can inspire and organize the process of other people learning				
			2.	Student is aware of and understands the validity of the non-technical aspects and effects of engineering activities, including its impact on the environment, and the associated responsibility for decisions				

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	29	15	Associated Prof. Anna Król
Calculation class			
Labolatory class			
Project			
Seminar	29	15	Associated Prof. Anna Król
Total	58	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	lecture in the auditorium

Item	Content of course	Hours
1.	Definitions and classification of waste	2

2.	Methods for assessing the properties of waste	2
3.	Strategy in waste management	1
4.	Principles of material recovery	2
5.	Methods of material reuse of municipal waste	3
6.	Methods of material reuse of industrial waste	5

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	writting test		

SEMINAR	Execution method	presentations of knowledge by students

Item	Content of course	Hours
1.	Advanced methods of material reuse of selected industrial and municipal waste	15

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Individual oral presentations		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has broadened knowledge of phenomena and processes observation and knows the methods of measurement of	LE	IS_K2_W12
	2.	Student has specialized knowledge for solving problems related to environmental engineering.	LE, S	IS_K2_W13
	3.	Student has knowledge of methods, tools and models of environmental management including waste management.	LE,	IS_K2_W08
Skills	1.	Student has autonomous learning skills, works individually and in a team.	LE, S	IS_K2_U08
	2.	Student can make a critical analysis of the functioning and evaluate the existing technical solutions used in environmental engineering.	LE	IS_K2_U21
	3.	Student evaluates the processes, equipment, objects and systems related to environmental engineering in terms of their energy and economic efficiency and their influence on the environment.	LE	IS_K2_U23
Social Competence	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate	LE, S	IS_K2_K01
	2.	Student is aware of the importance and it can understand the non-technical aspects and effects of engineering actions, including their impact on the environment, and the associated responsibility for decisions.	LE, S	IS_K2_K05
	3.	Student can understand the social role of an engineer and can understand the need for reliable public information about the achievements of engineering.	LE	IS_K2_K08

Teaching methods:

– lecture
– seminar

Form of assessment:

Form:	Writing exam
Condi-tions:	Exam - pass all parts of this subject and positive note from the test

Basic references:

[1] Tchobanoglous G., Kreith F.: Handbook of Solid Waste Management, McGraw-Hill Handbooks, 2002

[2] Scott N.: Reduce, Reuse, Recycle, Green Books, 2007

[3] Tchobanoglous G.,Theisen H.,Vigil S.A: Integrated Solid Waste Management: Engineering Principles and Management Issues, McGraw-Hill Publishing Co.

Additional references:

[1] Ekstrom K.M.: Waste Management and Sustainable Consumption: Reflections on Consumer Waste, ROUTLEDGE London 2014

[2] Williams P.T.: Waste Treatment and Disposal, John Wiley & Sons Ltd, 2005

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Head of the organizational unit *(stemp/signature)*	Dean of Mechanical Faculty *(stemp/signature)*

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	THIRD

Course Title			Modeling of Pollutant Propagation in Atmosphere				Basic Science (Y/N)	N
Tytuł przedmiotu			Modelowanie rozprzestrzeniania zanieczyszczeń w atmosferze					
ECTS points						Mode of complete the course		Course code
Total	3	Cont.	1,2	Pract.	1,2	Coruse Credit		C.2.3.
Preliminary requirements of the course		Name of course		GIS, Environmental Fluid Transport				
		Knowledge		1.	Bases of GIS.			
				2.	Gas dynamics.			
		Skills		1.	Proficient computer skills.			
				2.	Creates, edits and uses basic attribute of vector layers in GIS program.			
				3	Creats base forms of gas conservation equations.			
		Social Competence		1.	Notes the complexity of pollutant propagation problems.			
				2.	It is persistent in the study of pollutant transport in atmosphere.			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	29	15	PhD eng. Jacek Wydrych
Calculation class			
Labolatory class	29	15	PhD eng. Jacek Wydrych
Project			
Seminar			
Total	58	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Slide presentations, Notes, Book

Item	Content of course	Hours
1.	Meteorology	1
2.	Plume Rise	1
3.	Sources of pollutants (point, line, surface)	1
4.	Source Effects	1
5.	Gaussian Plume Model for Continuous Sources	2
6.	Statistical Models of Diffusion from Continuous-Point Sources	1
7.	Puff Diffusion	1
8.	Similarity Models of Diffusion	1
9.	Gradient Transport(K) Models	1
10.	Urban Diffusion Models	1
11.	Removal Mechanisms	1
12.	Cooling Tower Plumes and Drift Deposition	1
13.	Air-Pollution Meteorology in Complex Terrain	1
14.	Long-Range Transport and Diffusion	1

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Middle and final tests		

LABORATORY CLASS	Execution method	Practice in computer laboratory

Item	Content of course	Hours
1.	Gaussian plume model and dispersion calculations for point sources in local scales	2
2.	Effective height and plume rise	2
3.	Estimation of the wind change with height	2
4.	Practical exercise in computation of dispersion from industrial sources	5
5.	Interpolation of measurement data using the SADA program	4

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Excel sheets and reports of working the sheets; SADA report		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student knows statistical methods of data analysis and measurement results development.	LE, LA	IS_K2_W05
	2.	in solving engineering tasks in the field of environmental engineering.	LE, LA	IS_K2_W06
	3.	Student has knowledge of process, phenomena and device modeling in environmental engineering.	LE, LA	IS_K2_W07
Skills	1.	Student can use statistical methods in data development and environmental analysis.	LA	IS_K2_U03
	2.	Student uses computer programs to solve engineering tasks.	LA	IS_K2_U04
	3.	Student is able to carry out the analysis of engineering tasks and apply simulation methods leading to the solution, interpret the results, draw conclusions and test the hypothesis.	LA	IS_K2_U14
Social Competence	1.	Student is aware of the importance and it can understand the non-technical aspects and effects of engineering actions, including their impact on the environment, and the associated responsibility for decisions.	LE, LA	IS_K2_K05
	2.	Student can think and act in a creative, innovative and entrepreneurial way.	LA	IS_K2_K07
	3.	Student can understand the social role of an negineer and can understand the need for reliable public information about the achievements of engineering.	LE, LA	IS_K2_K08
	...			

Teaching methods:

– lecture
– laboratory class

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Steven R.H.: Handbook on ATMOSPHERIC DIFFUSION, TECHNICAL IN F0RMATI0N CENTER U.S. DEPARTMENT OF ENERGY, 1982

[2] Ramaswami A.: Integrated environmental modeling, Pollutant Transport, Fate, and Risk in the Environment, Anu Ramaswami, John Wiley & Sons Inc., 2005

Additional references:

[1] Markiewicz M.: Podstawy modelowania rozprzestrzeniania się zanieczyszczeń w powietrzu atmosferycznym, Oficyna Wyd.Politechniki Warszawskiej, 2004

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Head of the organizational unit
(stemp/signature)

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Dean of Mechanical Faculty
(stemp/signature)

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	THIRD

Course Title			Modelling of Energy Systems			Basic Science (Y/N)	N
Tytuł przedmiotu			Modelowanie systemów energetycznych				
ECTS points						Mode of complete the course	Course code
Total	2	Cont.	1,2	Pract.	1,2	Exam	C.4.3.
Preliminary requirements of the course		Name of course		Mathematics, Physics, Chemistry, Energy obtaining techniques			
		Knowledge		1.	Student knows first and second low of thermodynamics.		
				2.	Student has basic knowledge on energy conversion systems.		
				3.	Student has basic knowledge on thermodynamics.		
		Skills		1.	Student is able to make basic mass and energy balances as well as derive basic energy quantities.		
				2.	Student posseses a self-learning skills and is able to work both individually and in a team.		
		Social Competence		1.	Student correctly identifies engineering problems in field of heat and electricity generating.		

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	29	15	PhD eng. Mariusz Tańczuk
Calculation class			
Labolatory class			
Project	29	15	PhD eng. Mariusz Tańczuk
Seminar			
Total	58	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in classroom

Item	Content of course	Hours
1.	Steam-water thermal cycles	3
2.	Steam power plants and heat generating and power plants	3
3.	Mothodology of modelling of energy conversion plants	3
4.	Engineering equation solver - introduction and calculation examples	6

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Writing exam. Test to verify knowledge of the issues.		

PROJECT	Execution method	Individual work in classroom

Item	Content of course	Hours
1.	Establishing input data to the project	1
2.	Entering and solving equations	9
3.	Single variable optimization	3

4.	Formulation of conclusions		2
Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Checking individual project		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has knowledge of conventional and alternative energy sources and of technical and technological possibilities of generating, converting and application.	LE, P	IS_K2_W04
	2.	Student knows numerical and computer methods and tools useful in solving engineering tasks in the field of environmental engineering	LE, P	IS_K2_W06
	3.	Student has knowledge of process, phenomena and device modeling in environmental engineering.	LE, P	IS_K2_W07
	4.	Student knows methods, techniques and equipment for analyzing physical, chemical and biological phenomena from the perspective of engineering and environmental protection, has basic knowledge of life cycle of equipment, objects and technical systems.	LE,P	IS_K2_W15
Skills	1.	Student uses computer programs to solve engineering tasks.	LE, P	IS_K2_U04
	2.	Student is able to communicate in the range relating to environmental engineering using different techniques in various environments, also in a foreign language.	LE, P	IS_K2_U05
	3.	Student can use information and communication techniques necessary for the implementation of typical engineering activities	LE, P	IS_K2_U10
	4.	Student can - in accordance with set specification - design and implement a simple device, object, system or process typical for environmental engineering using appropriate methods, techniques and tools.	LE, P	IS_K2_U22
Social Competence	1.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	LE, P	IS_K2_K01
	2.	Student can correctly identify engineering problems and is able to set priotities for professional activities.	LE, P	IS_K2_K03
	3.	Student is able to interact and work in a group performing different roles; Student can uderstand the importance of collective action.	LE, P	IS_K2_K04
	...			

Teaching methods:

– lecture
– project

Form of assessment:

Form:	Writing exam
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Doty S., Turner W.C.: Energy Management Handbook, Seventh Edition, CRC Press 2009

[2] Cengel Y., Boles M.: Thermodynamics: An Engineering Approach, McGraw-Hill Science/Engineering/Math, 7th edition, 2010

[3] Michael J. Moran et al.: Fundamentals of Engineering Thermodynamics. Wiley. 8 edition, 2014

Additional references:

[1] Energy Systems. Optimization, Modeling, Simulation, and Economic Aspects, Journal, Springer

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Head of the organizational unit
(stemp/signature)

Dean of Mechanical Faculty
(stemp/signature)

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of study	Full-time studies
Semester	THIRD

Course Title		Modelling of Water Distribution Systems				Basic Science (Y/N)	N
Tytuł przedmiotu		Modelowanie systemów zaopatrzenia w wodę					
ECTS points						Mode of complete the course	Course code
Total	3	Cont.	1,8	Pract.	1,8	Coruse Credit	C.1.3.
Preliminary requirements of the course		Name of course		Fluid Mechanics			
		Knowledge		1.	Knowledge of the basic physical laws of hydrostatics and		
				2.	Basic knowledge of flow in pipes		
		Skills		1.	Working with computer		
		Social Competence		1.	Capacity for undertaking continuous learning and adapting to new circumstances		

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	10	15	PhD eng. Andrzej Spyra
Calculation class			
Labolatory class	45	30	PhD eng. Andrzej Spyra
Project			
Seminar			
Total	55	45	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Classroom lecture

Item	Content of course	Hours
1.	Course introduction, simulation model concept, brief history	1
2.	Fluid properties, statics & dynamics, energy losses, friction, resistance coefficients	2
3.	Computer simulation of pipe network systems (EPANET and similar software)	1
4.	Software description: capabilities, user interface, input data, output results	2
5.	Water system components: pipes, junctions, reservoirs, tanks, pumps and valves	2
6.	Water quality: water age, chlorine concentration	1
7.	Assembling the model: drawing the network, working with maps etc.	3
8.	Working with the model, visualization of the calculated results	2
9.	Demand determination	1

Sudent's own study (h)	10	Contact hours per semester	15
Methods of checking intended learning outcomes	Practical computer-based problem solving work		

LABORATORY CLASS	Execution method	Problem sheets and computer based problem solving

Item	Content of course	Hours
1.	Laboratory procedures & safety, Lab Reports	1
2.	Modelling the simple systems consisting of single pipes	2

3.	Modelling the simple systems with pump	2
4.	Loading maps and Google Earth images	2
5.	Modelling networks	4
6.	Demand allocation	2
7.	Time simulation	4
8.	Modelling the water quality	3
9.	Analyze a variety of water distribution system problems	8
10.	Design a small water distribution system to meet given parameters for water source supply, demands etc.	2

Sudent's own study (h)	15	Contact hours per semester	30
Methods of checking intended learning outcomes	Labolatory reports, Practical problem sessions		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	in solving engineering tasks in the field of environmental engineering.	LE, LA	IS_K2_W06
	2.	Student has knowledge of process, phenomena and device modeling in environmental engineering.	LE, LA	IS_K2_W07
	3.	Student knows the rules of engineering design and computer programmmes which support designing of environmental infrustructure.	LE, LA	IS_K2_W11
	4.	investment documentation, organization of construction and installation works.		IS_K2_W09
Skills	1.	Student uses computer programs to solve engineering tasks.	LA	IS_K2_U04
	2.	Student can use information and communication techniques necessary for the implementation of typical engineering activities	LA	IS_K2_U10
	3.	Student is able to carry out the analysis of engineering tasks and apply simulation methods leading to the solution, interpret the results, draw conclusions and test the hypothesis.	LE, LA	IS_K2_U14
	4.	Student can - in accordance with set specification - design and implement a simple device, object, system or process typical for environmental engineering using appropriate methods, techniques and tools.	LE, LA	IS_K2_U22
Social Competence	1.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	LE, LA	IS_K2_K01
	2.	Student can think and act in a creative, innovative and entrepreneurial way.	LA	IS_K2_K07
	...			

Teaching methods:

– lecture
– laboratory class

Form of assessment:

Form:	Writing test
Condi-	Course Credit + pass all parts of this subject

tions:

Basic references:

[1] Arnalich S.: ***Epanet and Development. How to calculate water networks by computer,*** **Arnalich, Water and Habitat, 2011**

[2] Arnalich S.: ***Epanet and Development: A progressive 44 exercise workbook,*** **Arnalich, Water and Habitat,**

[3] Rossman L.: ***Epanet 2 User's Manual,*** **US Environmental Protection Agency, Cincinnati, USA, 2000**

[4] Lecture Notes

[5] Laboratory Manual

Additional references:

[1] Walski T.M. et al: ***Advanced Water Distribution Modelling and Management,*** **Bentley Institute Press, 2007**

[2] Mays L.W.: ***Water Distribution Systems Handbook,*** **McGraw-Hill Press, 1999**

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Head of the organizational unit
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Dean of Mechanical Faculty
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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of study	Full-time studies
Semester	FIRST

Course Title		Modern Materials in Engineering Applications				Basic Science (Y/N)	N
Tytuł przedmiotu		Nowoczesne materiały w zastosowaniach inżynierskich					
ECTS points						Mode of complete the course	Course code
Total	1	Cont.	0,6	Pract.		Coruse Credit	A.3.
Preliminary requirements of the course		Name of course		Physics, chemistry			
		Knowledge		1.	Student has extended and deepened knowledge of mathematics, physics, chemistry and other areas appropriate for the field of study useful for formulating and solving complex tasks related to the field of study.		
				2.	Student has knowledge of development trends and the most important new developments in the field of science and scientific disciplines relevant to the studied field of study and related disciplines.		
				...			
		Skills		1.	Student is able to obtain information from the literature, databases and other properly selected sources in English or another foreign language recognized as the language of communication studies in terms of the international field of study; it can integrate acquired information, it make their interpretation and critical evaluation, as well as to draw conclusions and formulate and fully justify opinions.		
				2.	Student can communicate using a variety of techniques in the workplace and in other environments, also in English or another foreign language recognized as a international communication language in the field of study.		
		Social Competence		1.	Student understands the need for lifelong learning, it can inspire and organize the process of other people learning.		
				2.	Student is aware of and understands the validity of the non-technical aspects and effects of engineering activities, including its impact on the environment, and the associated responsibility for decisions.		

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	29	15	Associated Prof. Anna Król
Calculation class			
Labolatory class			
Project			
Seminar			
Total	29	15	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in the auditorium

Item	Content of course	Hours
1.	Sustainable development in the industry in context of using materials	2
2.	Structure of materials	1
3.	Biodegradable materials of natural origin	1
4.	Synthetic biodegradable materials	1
5.	Metals in engineering applications	1
6.	Plastic in engineering applications	2
7.	Modern ceramic materials	2
8.	Modern mineral materials	5

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Writting test		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has current knowledge in the field of innovative technologies used in environmental engineering and related science disciplines, knows the principle of sustainable development.	LE	IS_K2_W17
	2.	Student knows methods, techniques, tools and materials used in solving complex engineering tasks in the field of environmental engineering.	LE	IS_K2_W18
	3.	Student has specialized knowledge for solving problems related to environmental engineering.	LE	IS_K2_W13
Skills	1.	Student is able to communicate in the range relating to environmental engineering using different techniques in various environments, also in a foreign language.	LE	IS_K2_U05
	2.	Student has autonomous learning skills, works individually and in a team.	LE	IS_K2_U08
	3.	Student can make a critical analysis of the functioning and evaluate the existing technical solutions used in environmental engineering.	LE	IS_K2_U21
Social Competence	1.	Student can correctly identify engineering problems and is able to set priotities for professional activities.	LE	IS_K2_K03
	2.	Student can understand the social role of an negineer and can understand the need for reliable public information about the achievements of engineering.	LE	IS_K2_K08

Teaching methods:

– lecture

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] W.F. Hosford, Mechanical Behavior of Materials, Cambridge University Press (2005)
[2] R.W. Cahn (Ed.), Concise Encyclopaedia of Materials Characterization, Elsevier (2005)

[3] M.G. Horton, Ceramic Materials: Science and Engineering, Springer (2007)
[4] M.S. Mamlouk, J.P. Zaniewski, Materials for Civil and Construction Engineers, Pearson Prentice

Additional references:

[1] Neville A.M., BrooksJ.J., Concrete Technology, Pearson Education 2008
[2] Martin J., Materials for Engineering (Third Edition) Woodhead Publishing Limited 2006
[3] Ashby M.F. Materials and the Environment (Second Edition) Elsevier 2013

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Head of the organizational unit
(stemp/signature)

Dean of Mechanical Faculty
(stemp/signature)

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Filed of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	SECOND

Course Title		Multiphase Flow in Environmental Technology				Basic Science (Y/N)	N
Tytuł przedmiotu		Przepływy wielofazowe w techologii inżynierii środowiska					
ECTS points						Mode of complete the course	Course code
Total	2	Cont.	1	Pract.	1,2	Coruse Credit	E.9.
Preliminary requirements of the course		Name of course		Fluid dynamics, process engineering in environmental technology			
		Knowledge		1.	Student has knowledge of fluid dynamics		
				2.	Student knows the equipment and its components flow		
		Skills		1.	Student knows how to construed physical phenomena		
		Social Competence		1.	Student understands the need for further education		

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	29	15	Associated Prof. Gabriel Filipczak
Calculation class			
Labolatory class			
Project	29	15	Associated Prof. Gabriel Filipczak
Seminar			
Total	58	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lectures in classroom

Item	Content of course	Hours
1.	Multiphase Processes - introduction	1
2.	Gas-liquid two-phase flow - introduction	1
3.	Maps and structure of the gas-liquid flow	1
4.	The void fraction of the gas phase in the flowing mixture	1
5.	Pressure drop of gas-liquid two-phase flow	1
6.	Fluid-solid two-phase flow	1
7.	Thin layer rafting down flow	1
8.	The thickness of the liquid film flowing down	1
9.	Maps and structure of the film flow of the gas-liquid	1
10.	Void fraction and pressure drop in falling film flow	1
11.	Liquid-liquid two-phase flow	1
12.	Maps and structure of liquid-liquid flow.	1
13.	Two-phase flow in microchannels	1
14.	Three-phase flow of gas-liquid-liquid - application	1
15.	Maps and patterns of gas-liquid-liquid flow	1

Sudent's own study (h)	14	Contact hours per semester	15

Methods of checking intended learning outcomes	**Written test**		
PROJECT	**Execution method**	**Individual work of student in classroom**	
Item	**Content of course**		**Hours**
1.	**The conceptual design covering issues of some problems of multiphase flow and environmental engineering**		**15**
Sudent's own study (h)	**14**	**Contact hours per semester**	**15**
Methods of checking intended learning outcomes	**Assessment of computational problems and the ability to perform design and technical documentation**		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			**Form of course (LE, C, LA, P, S)**	**The reference to the learning outcomes**
Knowledge	**1.**	**Student has broadened knowledge of phenomena and processes observation and knows the methods of measurement of characteristic quantities relevant to the environmental engineering.**	**LE, P**	**IS_K2_W12**
	2.	**Student demonstrates structured and theoretically underpinned basic knowledge which includes main issues of environmental engineering. Student has knowledge about role of environment, is aware of risks and knows methods of their identification and limitation.**	**LE, P**	**IS_K2_W16**
Skills	**1.**	**Student is able to plan and carry out experiments, to interpret the results and to draw conclusions.**	**LE, P**	**IS_K2_U12**
	2.	**Student is able to carry out the analysis of engineering tasks and apply simulation methods leading to the solution, interpret the results, draw conclusions and test the hypothesis.**	**LE, P**	**IS_K2_U14**
	3.	**Student can make a critical analysis of the functioning and evaluate the existing technical solutions used in environmental engineering.**	**LE, P**	**IS_K2_U21**
Social Competence	**1.**	**Student can correctly identify engineering problems and is able to set priotities for professional activities.**	**LE, P**	**IS_K2_K03**
	2.	**Student can think and act in a creative, innovative and entrepreneurial way.**	**LE, P**	**IS_K2_K07**
	...			

Teaching methods:

– lecture
– project

Form of assessment:

Form:	**Writing test**
Condi-tions:	**Course Credit + pass all parts of this subject**

Basic references:

[1] Hestroni G.: Handbook of multiphase systems, Hemisphere Publ. Corp. Washington, 1982
[2] Carradini M.I.: Fundamentals of multiphase flows. University of Viscontin, 1997

Additional references:

[1] Brennen C.E.: Fundamentals of multiphase flows, California-Cambridge University Press, 2005

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Head of the organizational unit
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Dean of Mechanical Faculty
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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of study	Full-time studies
Semester	SECOND

Course Title		Renewable Energy Technologies					Basic Science (Y/N)	N
Tytuł przedmiotu		Technologie Odnawialnych Źródeł Energii						
ECTS points						Mode of complete the course	Course code	
Total	4	Cont.	1,8	Pract.	1,2	Exam	B.2.	
Preliminary requirements of the course		Name of course		Physics, Chemistry, Energy obtaining techniques				
		Knowledge		1.	Student is aware of the potential of fossil fuels and renewable energy sources. He knows the economic and social role of the renewable energy sources usage.			
		Skills		1.	Student Is able to analyze existing technologies, used in environmental engineering.			
				2.	Students has a self-learning skills; works individually and in a team.			
		Social Competence		1.	Correctly identifies engineering problems.			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	59	30	PhD eng. Stanisław Anweiler
Calculation class			
Labolatory class	29	15	PhD eng. Stanisław Anweiler
Project			
Seminar			
Total	88	45	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in classroom

Item	Content of course	Hours
1.	General classification of energy sources	3
2.	Resources of conventional and renewable energy	3
3.	The carbon footprint - the benefits and ecological damage	3
4.	Passive and active methods for renewable energy usage	3
5.	Active solar energy conversion systems	3
6.	Harnessing the power of moving water	3
7.	The use of the energy contained in the biomass	3
8.	Atomic energy	3
9.	Energy storage	3
10.	Unconventional energy devices and systems	3

Sudent's own study (h)	29	Contact hours per semester	30
Methods of checking intended learning outcomes	Writing exam. Test to verify knowledge of the issues.		

LABORATORY CLASS	Execution method	Performed Measurements	
Item	**Content of course**		**Hours**
1.	Examination of flat plate solar collector		3
2.	The study of vacuum solar collector		3
3.	Examination of the wind turbine		3
4.	Photovoltaic cell study		3
5.	Study of photovoltaic farm		3
Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Test to verify knowledge of the issues. The report of performed measurements		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has broadened and deepened knowledge of selected fields of mathematics, physics, chemistry, biology and earth science in terms necessary to describe phenomena and processes related to environmental engineering technology.	LE, LA	IS_K2_W01
	2.	Student has knowledge of conventional and alternative energy sources and of technical and technological possibilities of generating, converting and application.	LE, LA	IS_K2_W04
	3.	Student has broadened knowledge of phenomena and processes observation and knows the methods of measurement of characteristic quantities relevant to the environmental engineering.	LE, LA	IS_K2_W12
	...	Student has specialized knowledge for solving problems related to environmental engineering.	LE, LA	IS_K2_W13
Skills	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate	LE, LA	IS_K2_U01
	2.	Student is able to communicate in the range relating to environmental engineering using different techniques in various environments, also in a foreign language.	LE, LA	IS_K2_U05
	3.	Student can use the measurement devices, is able to estimate errors.	LE, LA	IS_K2_U13
Social Competence	1.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	LE, LA	IS_K2_K01
	2.	Student is able to interact and work in a group performing different roles; Student can uderstand the importance of collective action.	LE, LA	IS_K2_K04
	3.	Student can understand the social role of an negineer and can understand the need for reliable public information about the achievements of engineering.	LE, LA	IS_K2_K08
	...			

Teaching methods:

– lecture
– laboratory class

Form of assessment:

Form:	Writing exam
Condi-tions:	Exam - pass all parts of this subject and positive note from the test

Basic references:

[1] Dilwyn Jenkins, Renewable energy systems: the Earthscan expert guide to renewable energy technologies for home and business, London, 2013

[2] Bent Sorensen, Renewable energy conversion, transmission and storage, Elsevier/Academic Press, 2011

[3] John R. Howell, Solar-Thermal Energy Systems: Analysis and Design, McGraw-Hill Book Co., 1982

Additional references:

[1] Dorota Chwieduk, Roman Domański, Maciej Jaworski ed., Renewable Energy: Innovative Technologies and New Ideas, Warsaw University of Technology, 2008

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Head of the organizational unit
(stemp/signature)

Dean of Mechanical Faculty
(stemp/signature)

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	FIRST

Course Title		Safety and Reliability of Engineering Systems				Basic Science (Y/N)	N
Tytuł przedmiotu		Niezawodność i bezpieczństwo systemów inżunierskich					
ECTS points						Mode of complete the course	Course code
Total	2	Cont.		Pract.	2	Coruse Credit	A.4.
Preliminary requirements of the course		Name of course		Equipment and systems of environmental engineering			
		Knowledge		1.	General knowledge of chemistry on the properties of the so-called hazardous substances.		
				2.	Fundamentals of technology and industrial equipment.		
		Skills		1.	Self-learning skills and acquiring information literature.		
		Social Competence		1.	The ability to think and act in a creative and innovative and enterprising way.		

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surmame)
Lecture	25	15	Associated Prof. Gabriel Filipczak
Calculation class			
Labolatory class			
Project			
Seminar	25	15	Associated Prof. Gabriel Filipczak
Total	50	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lectures in classroom

Item	Content of course	Hours
1.	Reliability - basic concepts	1
2.	Reliability indicates	1
3.	Structural Reliability	1
4.	Overview of the hazards in the environmental engineering	1
5.	The causes of accidents, incidents and disasters	1
6.	European major accident prevention of SEVESCO system	1
7.	assessment methods of failure risk and predicting their effects	1
8.	Identification of dangerous objects and processes	1
9.	The classification of dangerous substances	1
10.	Basocs of industrial safety management systems	1
11.	Legal requirements for safety systems	1
12.	The spread contamination of dangerous substances	1
13.	Fires, explosions and toxic contamination	1
14.	Fire and explosion-proof security and protection against pverpressure	1
15.	Safety Check - notified bodies	1

Sudent's own study (h)	10	Contact hours per semester	15
Methods of checking intended learning outcomes	Written test		

SEMINAR	Execution method	Seminar in classroom

Item	Content of course	Hours
1.	Some specific areas of security and reliability engineering systems	15

Methods of checking intended learning outcomes	Evaluation of individual oral presentation

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student knows rules of identifying danger, security, hygiene of work and ergonomics during the construction and installation operations used in environmental engineering.	LE, S	IS_K2_W03
	2.	Student has knowledge of using legal regulations, norms and guidelines in designing and operation of technical objects.	LE, S	IS_K2_W19
Skills	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	S	IS_K2_U01
Social Competence	1.	Student can understand the importance of necessity to provide safe working environment.	LE, S	IS_K2_K02
	2.	Student is aware of the importance and it can understand the non-technical aspects and effects of engineering actions, including their impact on the environment, and the associated responsibility for decisions.	LE, S	IS_K2_K05
	...			

Teaching methods:

– lecture
– seminar

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Lees P.S. "Loss Prevention in the Process Industries", 2'"1 ed., Butterworth-Heinemann,1996

[2] Crawal D. A., Louvar J. F.: Chemical process safety fundamentals with applications. Prentice Hall Int. Series, 1990

Additional references:

[1] Guidelines for Engineering Design for Process Safety, AIChE, CCPS, N.Y. 1993

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Head of the organizational unit
(stemp/signature)

Dean of Mechanical Faculty
(stemp/signature)

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	SECOND

Course Title		Spatial Planning and Urban Design					Basic Science (Y/N)	N
Tytuł przedmiotu		Planowanie przestrzenne i urbanistyka						
ECTS points						Mode of complete the course		Course code
Total	2	Cont.	1,2	Pract.	1,2	Coruse Credit		E.8.
Preliminary requirements of the course		Name of course		GIS, Computer Aided Design				
		Knowledge		1.	Bases of GIS			
				2.	Bases of CAD			
		Skills		1.	Proficient computer skills			
				2.	Creates, edits and uses basic attribute of vector layers in GIS program			
				3	Creates 3D objects in any CAD program			
		Social Competence		1.	Notes the complexity of spatial problems			
				2.	It is persistent in the study of spatial problems			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	25	15	PhD eng. Jacek Wydrych
Calculation class			
Labolatory class			
Project	29	15	PhD eng. Jacek Wydrych
Seminar			
Total	54	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Slide presentations, Notes, Book

Item	Content of course	Hours
1.	Spatial conjunctions of society development (space and time like essential entities and progress parameters of human society; historical development, current situation and evolutional tendency in global, national and regional criteria, especially in central Europe, spatial consequences of globalization)	1
2.	Settlement of Poland (structure of residential system, mutual relations of seats; town-planning and building structure of seats, use of territory; international confrontation, especially with neighbouring states; settlement changes in conditions)	1
3.	Settlement system and towns theory (urbanization, suburbanization, des-urbanization, re-urbanization)	1
4.	Typology of town agglomerations and towns in Europe and Poland (factor affecting settlement and town development; tools for purposeful interaction development of municipal system and towns; resident axis and centre seats,"network of towns"; relation between towns and its background)	2

5.	Function of towns, functional, town-planning and building structure of towns (town like grown organism; urban analysis of towns; zoning and draft "towns of short routes"; town-planning structure of contemporary big towns in Poland and parameters of their parts, morphology of towns)	2
6.	Characteristic of the main functional components of towns and their mutual connections (a town like place of residence and workplace, resting-place and recreation, centre of administration, culture and education and their operational and town-planning connections)	2
7.	Characterization of "technical" components of towns" (technical infrastructure, traffic roads and arrangements, telecommunication)	2
8.	Rural space and rural seats and landscape (typology of rural space and rural seats and their functional, town-planning and building characteristics, structure of land and changes in its arrangements and use)	1
9.	Land-use planning like instrument of regulation development, arranging seats and land and relation to other territorial relevant kinds of planning (relation to territorial planning and developing programs on level of regions and municipalities; territorial connections developing plan corporations and institutions; land-use planning and landed modifications; land-use planning and branch planning - in sector of agriculture and wood economy, transport and technical infrastructure, living and civic equipments and services)	2
10.	Systematics spatially relevant planning in European union - divergences of spatial planning in Germany and France and land-use planning in Poland, territorial basic informations for cross-border cooperation; information system and land-use planning)	1

Sudent's own study (h)	10	Contact hours per semester	15
Methods of checking intended learning outcomes	Middle and final tests		

PROJECT	Execution method	Practice in computer laboratory

Item	Content of course	Hours
1.	Topographic, basic and cadastral maps	1
2.	Land and buildings Registers	1
3.	The content of the conditions and directions study of spatial planning	1
4.	The content of the local development plan	1
5.	The use of geographic information systems (GIS) in spatial planning	3
6.	The use of CAD systems in urban planning	2
7.	Urban Design in CAD program	3
8.	The spatial planning project in GIS program	3

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Textual (reports) and graphical (maps) part of the project		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has knowledge of spatial planning at local and supra-local levels.	LE	IS_K2_W02
	2.	Student knows statistical methods of data analysis and measurement results development.	LE, P	IS_K2_W05
	3.	Student has knowledge necessary to understand social, economical, legal and other non-technical conditions of engineering activities and their role in engineering practice.	LE, P	IS_K2_W20
Skills	1.	Student can use statistical methods in data development and environmental analysis.	P	IS_K2_U03
	2.	Student uses computer programs to solve engineering tasks.	P	IS_K2_U04
	3.	Student can formulate general guidelines for spatial planning in a graphical and descripitive manner.	LE,P	IS_K2_U11

Social Competence	1.	Student is able to interact and work in a group performing different roles; Student can uderstand the importance of collective action.	P	IS_K2_K04
	2.	Student is aware of the importance and it can understand the non-technical aspects and effects of engineering actions, including their impact on the environment, and the associated responsibility for decisions.	LE,P	IS_K2_K05
	3.	Student can think and act in a creative, innovative and entrepreneurial way.	P	IS_K2_K07
	...			

Teaching methods:

– lecture
– project

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Spatial Planning and Urban Development, Pier Carlo Palermo, Springer, 2010
[2] The Image of the City, Kevin Lynch, MIT Press, 1960

Additional references:

[1] Leksykon urbanistyki i planowania przestrzennego, Piotr Saternus, BEL studio, 2013
[2] Google SketchUp for Site Design, Daniel Tal, Kindle, 2014
[3] A Gentle Introduction to GIS, T. Sutton, 2009

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Head of the organizational unit
(stemp/signature)

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Dean of Mechanical Faculty
(stemp/signature)

OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of study	Full-time studies
Semester	FIRST

Course Title		Sustainable Development for Engineers					Basic Science (Y/N)	N
Tytuł przedmiotu		Zrównoważony rozwój dla inżynierów						
ECTS points						Mode of complete the course	Course code	
Total	3	Cont.	1,2	Pract.		Course credit	E.1.	
Preliminary requirements of the course		Name of course						
		Knowledge		1.	Student has expanded and deepened knowledge of selected fields of chemistry, biology and earth sciences to the extent necessary to describe phenomena and processes related to environmental engineering technologies.			
		Skills		1.	Student obtains information from literature, databases, and other sources related to the technical sciences; can integrate the information obtained, to make their interpretation, draw conclusions and formulate opinions.			
		Social Competence		1.	Student understands the need for training to improve professional skills, is able to inspire and organize the learning process of others.			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	50	30	PhD eng. Iwona Kłosok-Bazan
Calculation class			
Labolatory class			
Project			
Seminar			
Total	50	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	
Item	Content of course	Hours
1.	Basic of Sustainable Development	2
2.	Why sustainability is so important	2
3.	Sustainable Development in practice	2
4.	Sustainability indicators	2
5.	Measuring sustainability	2
6.	Environmental hazards and squandering resources	2
7.	Environmental Impact Assesment	2
8.	Integrated Product Policy (LCA) - part I	2
9.	Integrated Product Policy (LCA) - part II	2
10.	Sustainable development in the company	2
11.	Economic aspects of Sustainable Development	2
12.	Sustainable Development and innovation process	2

13.	Environmental aspects of innovation and new technology transfer	2
14.	Finding ways of implementing sustainability - part I	2
15.	Finding ways of implementing sustainability - part II	2

Sudent's own study (h)	20	Contact hours per semester	30
Methods of checking intended learning outcomes	Writing test		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has specialized knowledge for solving problems related to environmental engineering.	LE	IS_K2_W13
	2.	Student demonstrates structured and theoretically underpinned basic knowledge which includes main issues of environmental engineering. Student has knowledge about role of environment, is aware of risks and knows methods of their identification and	LE	IS_K2_W16
	3.	Student has current knowledge in the field of innovative technologies used in environmental engineering and related science disciplines, knows the principle of sustainable development.	LE	IS_K2_W17
	4.	Student has knowledge necessary to understand social, economical, legal and other non-technical conditions of engineering activities and their role in engineering practice.	LE	IS_K2_W20
	5.	Student knows and understands the basic concepts and rules for the protection of industrial property, copyright and necessity of intellectual property management, is able to use patent information resources.	LE	IS_K2_W21
Skills	1.	Student is able to communicate in the range relating to environmental engineering using different techniques in various environments, also in a foreign language.	LE	IS_K2_U05
	2.	Student has autonomous learning skills, works individually and in a team.	LE	IS_K2_U08
	3.	Student can recognize the system and non-technical aspects during formulating and solving engineering tasks.	LE	IS_K2_U15
	4.	Student can make a critical analysis of the functioning and evaluate the existing technical solutions used in environmental engineering.	LE	IS_K2_U21
Social Competence	1.	Student can correctly identify engineering problems and is able to set priotities for professional activities.	LE	IS_K2_K03
	...			

Teaching methods:

– lecture

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] De Las Heras A.: Sustainability Science and Technology: An Introduction, CRC Press, 2014

[2] Allenby B.R.: The Theory and Practice of Sustainable Engineering Pearson (Prentice Hall), 2012.
Azapagic A., Perdan S.: Sustainable Development in Practice: Case Studies for Engineers and Scientists, 2nd Edition Wiley, 2011

Additional references:

Mulder K.: Sustainable Development for Engineers: A Handbook and Resource Guide Greenleaf Publishing, [1] 2006

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Head of the organizational unit
(stemp/signature)

Dean of Mechanical Faculty
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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	SECOND

Course Title		Techniques of Air Pollution Control					Basic Science (Y/N)	N
Tytuł przedmiotu		Techniki pomiaru zanieczyszczeń powietrza						
ECTS points						Mode of complete the course	Course code	
Total	4	Cont.	1,8	Pract.	2,2	Exam	C.2.1.	
Preliminary requirements of the course		Name of course		Air protection; meteorology and climatology; environmental metrology				
		Knowledge		1.	Use of information acquired during the study of first degree.			
				2.	Students is able to plan and carry out experiments, including measurements and computer simulations, interpret the results and draw conclusions.			
		Skills		1.	Student is able to plan and carry out experiments, including measurements and computer simulations, interpret the results and draw conclusions.			
				2.	Student is able to use and measurement of basic physical parameters which characterize the condition of atmosphere.			
		Social Competence		1.	Student is able to interact and work in a group, taking in her various roles.			
				2.	Student can appropriately prioritize for implementation set by themselves or others tasks.			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surmame)
Lecture	29	15	PhD eng. Tomasz Olszowski
Calculation class			
Labolatory class	55	30	PhD eng. Tomasz Olszowski
Project			
Seminar			
Total	84	45	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in classroom

Item	Content of course	Hours
1.	Introduction to air pollution control	1
2.	Air pollution effects	1
3.	Air pollution control legislations	1
4.	Natural scavenging processes in the troposphere	1
5.	Engineering approach for air quality control	1
6.	Natural of particulate pollutants	1
7.	Technology of particulates measurements	2
8.	Natural of gaseous pollutants	1

9.	Technology of gaseous contamination measurements	2
10.	Control of mobile source pollutants	1
11.	Biomonitoring	1
12.	How to develop measurement data	1
13.	Or only the substances are pollutants?	1

Sudent's own study (h)	14	Contact hours per semester	15

Methods of checking intended learning outcomes	Final exam - test

LABORATORY CLASS	Execution method	Workshop; real environmental measurements

Item	Content of course	Hours
1.	Ambient air TSP measurements	5
2.	Ambient air PM_{10} and $PM_{2.5}$ measurements	5
3.	Indoor TSP measurements	5
4.	Ambient air gaseous contamination measurements	5
5.	Indoor NO_2 contamination measurements	5
6.	Dry and wet dust deposition measurements	5

Sudent's own study (h)	25	Contact hours per semester	30

Methods of checking intended learning outcomes	Execution of experiments and preparing reports

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student knows statistical methods of data analysis and measurement results development.	LE, LA	IS_K2_W05
	2.	Student has broadened knowledge of phenomena and processes observation and knows the methods of measurement of characteristic quantities relevant to the environmental engineering.	LE, LA	IS_K2_W12
	3.	Student knows methods, techniques and equipment for analyzing physical, chemical and biological phenomena from the perspective of engineering and environmental protection, has basic knowledge of life cycle of equipment, objects and technical systems.	LE, LA	IS_K2_W15
Skills	1.	Student has autonomous learning skills, works individually and in a team.	LE, LA	IS_K2_U08
	2.	Student can use the measurement devices, is able to estimate errors.	LE, LA	IS_K2_U13
Social Competence	1.	Student can understand the necessity of further training, of improving professional skills, is able to inspire and organize learning process of others.	LE, LA	IS_K2_K01
	2.	Student is able to interact and work in a group performing different roles; Student can uderstand the importance of collective action.	LE, LA	IS_K2_K04
	3.	Student can understand the social role of an negineer and can understand the need for reliable public information about the achievements of engineering.	LE, LA	IS_K2_K08
	...			

Teaching methods:

– lecture
– laboratory class

Form of assessment:

Form:	**Writing exam**
Condi-tions:	**Exam - pass all parts of this subject and positive note from the test**

Basic references:

[1] Wark K., C.F. Warner C.F., W.T. Davis: Air Pollution Control: its Origin and Control, Addision-Wesley, (1998).

[2] De Nevers N.: Air Pollution Control Engineering, 2nd edition, McGraw-Hill International Editions, 2000.

[3] Phalen R.F., Phalen R.N.: Introduction to air pollution science, 2011.

Additional references:

[1] Articles from 'Atmposheric Pollution Research', 'Atmospheric Environment' and other Scientific Journals

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Head of the organizational unit **Dean of Mechanical Faculty**

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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Field of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of Study	Full-time studies
Semester	SECOND

Course Title			Waste to energy - application technologies			Basic Science (Y/N)	N
Tytuł przedmiotu			Energetyczne wykorzystanie odpadów				
ECTS points						Mode of complete the course	Course code
Total	2	Cont.	1,2	Pract.		Coruse Credit	C.3.2.

Preliminary requirements of the course	Name of course		Chemistry
	Knowledge	1.	Student has extended and deepened knowledge of mathematics, physics, chemistry and other areas appropriate for the field of study useful for formulating and solving complex tasks related to the field of
	Skills	1.	Student able to obtain information from the literature, databases and other properly selected sources in English or another foreign language recognized as the language of communication studies in terms of the international field of study.
		2.	Student posseses a self-learning skills.
	Social Competence	1.	Student is able to work both individually and in a team.

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surmame)
Lecture	25	15	Associated Prof. Małgorzata Wzorek
Calculation class			
Labolatory class			Associated Prof. Małgorzata Wzorek
Project			
Seminar	25	15	
Total	50	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lecture in classroom

Item	Content of course	Hours
1.	Definition, classification and sources of waste; physical, chemical and biological properties of waste as a fuel.	3
2.	Mechanical Biological - Treatment of Municipal Solid Waste.	2
3.	Technologies of Refuse Derived Fuels (RDF) production.	2
4.	Organic, agricultural and another wastes for biogas production. Cogeneration process	2
5.	Municipal Soild Waste Incineration: process and air pollution control.	2
6.	Co-combustion of waste and fuels from waste in cement industry.	2
7.	Co-combustion of fuels from waste in onther industry processes.	2

Sudent's own study (h)	10	Contact hours per semester	15
Methods of checking intended learning outcomes	Writing test to verify knowledge of the issues		

SEMINAR		Execution method	Presentations, discuss	
Item	Content of course			Hours
1.	Overview of the different processes of fuel from waste production.			12
2.	Classes include also a technical trip to a company – a manufacturer fuel from municipal waste, with the presentation of technological process and discussion.			3
Sudent's own study (h)		10	Contact hours per semester	15
Methods of checking intended learning outcomes		Assessment of prepared oral presentations and involvement in activities		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has knowledge of conventional and alternative energy sources and of technical and technological possibilities of generating, converting and application.	LE, S	IS_K2_W04
	2.	Student has current knowledge in the field of innovative technologies used in environmental engineering and related science disciplines, knows the principle of sustainable development.	LE, S	IS_K2_W17
	3.	Student has knowledge of using legal regulations, norms and guidelines in designing and operation of technical objects.	LE, S	IS_K2_W19
Skills	1.	Student uses intellectual achievements of other authors complying with copyright law in order to prepare scientific papers.	LE, S	IS_K2_U02
	2.	Student is able to communicate in the range relating to environmental engineering using different techniques in various environments, also in a foreign language.	LE, S	IS_K2_U05
	3.	Student can make a critical analysis of the functioning and evaluate the existing technical solutions used in environmental engineering.	LE,S	IS_K2_U21
Social Competence	1.	Student obtains information from literature, databases and other sources related to technical sciences; Student can integrate obtained information, interpret, draw conclusions and formulate opinions.	LE, S	IS_K2_K01
	2.	Student can correctly identify engineering problems and is able to set priotities for professional activities	LE, S	IS_K2_K03
	3.	Student can understand the social role of an engineer and can understand the need for reliable public information about the achievements of engineering.	LE, S	IS_K2_K08

Teaching methods:

– lecture
– seminar

Form of assessment:

Form:	Writing test
Condi-tions:	Course Credit + pass all parts of this subject

Basic references:

[1] Marc J., Rogoff M.J., Screve F.: Waste-to-Energy, Technologies and Project Implementation, Elsevier 2012.

[2] Klinghoffer N.B., Castaldi M., J.: Waste to Energy Conversion Technology, Woodhead Publishing Series in Energy, 2013.

[3] Tchobanoglous G., Kreith F.: Handbook of Solid Waste Management, McGraw-Hill Handbooks, 2002.

Additional references:

[1] Ekstrom K.M.: Waste Management and Sustainable Consumption: Reflections on Consumer Waste, ROUTLEDGE London 2014

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Head of the organizational unit
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Dean of Mechanical Faculty
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OPOLE UNIVERSITY OF TECHNOLOGY
FACULTY OF MECHANICAL ENGINEERING

Course Description Card

Filed of study	ENVIRONMENTAL ENGINEERING
Profile of Education	Academic
Level of study	MASTER's Degree
Specialization	Advanced Technologies in Environmental Engineering
Form of study	Full-time studies
Semester	FIRST

Course Title		Water Treatment Technologies					Basic Science (Y/N)	N
Tytuł przedmiotu		Technologie uzdatniania wody						
ECTS points						Mode of complete the course		Course code
Total	3	Cont.	1,2	Pract.	1,2	Exam		C.1.1.
Preliminary requirements of the course		Name of course						
		Knowledge		1.	Student has expanded and deepened knowledge of selected fields of chemistry, biology and earth sciences.			
		Skills		1.	Student obtains information from literature, databases, and other sources related to the technical sciences; can integrate the information obtained, to make their interpretation, draw conclusions and formulate opinions.			
				2.	Student can use information and communication technologies necessary for the implementation of common engineering activities.			
		Social Competence		1.	Student understands the need for training to improve professional skills, is able to inspire and organize the learning process of others.			

Content

The course format	Hours/sem. (h) Workload	Contact	Lecturer (title/academic degree, name and surname)
Lecture	29	15	PhD eng. Iwona Kłosok-Bazan
Calculation class			
Labolatory class	29	15	
Project			
Seminar			
Total	58	30	*Please note that the total number of full-time hours of class contact shall not be less than 0.5 hours total, including hours of private study*

Content

LECTURE	Execution method	Lectures in classroom

Item	Content of course	Hours
1.	Water quality standards, and regulations,	2
2.	Water Resources and Demad	2
3.	Individual processes and technologies typical for the surface water treatment	2
4.	Processes and techologies typical for the ground water treatment	2
5.	Coagulation and Focculation in Water Technology	2
6.	Filtrtion in Water Technology	2
7.	New Technology of Water Treatemnt	2
8.	Integrated Product Policy in Water Technology	1

Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Writing exam		

LABORATORY CLASS	Execution method	Laboratory tests	
Item	Content of course		Hours
1.	Rules for Safe Work in the Laboratory		1
2.	Testing Selected Water Quality		4
3.	Testing the Coagulation Process and System		4
4.	Testing the Oxidation Processes in Water Technology		4
5.	Testing the Deironing Processes		2
Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Reports of laboratory experiments		

PROJECT	Execution method		
Item	Content of course		Hours
1.	Drinking Water Tretment Plant Project		15
Sudent's own study (h)	14	Contact hours per semester	15
Methods of checking intended learning outcomes	Technical Documentation		

LEARNING OUTCOMES FOR THE COURSE - after completing the training cycle			Form of course (LE, C, LA, P, S)	The reference to the learning outcomes
Knowledge	1.	Student has knowledge of process, phenomena and device modeling in environmental engineering.	LE, LA, P	IS_K2_W07
	2.	Student knows the designing rules of devices and equipment used in environmental engineering and is familiar with development trends in construction of environmental protection installations.	LE, LA, P	IS_K2_W10
	3.	Student has knowledge of using legal regulations, norms and guidelines in designing and operation of technical objects.	LE	IS_K2_W19
Skills	1.	Student obtains information from literature, databases and other sources related to technical sciences; he/she can integrate obtained information, interpret, draw conclusions and formulate opinions.	LE, LA, P	IS_K2_U01
Social Competence	1.	Student can understand the importance of necessity to provide safe working environment.	LE, LA, P	IS_K2_K02
	2.	Student can think and act in a creative, innovative and entrepreneurial way.	LE, LA, P	IS_K2_K07
	...			

Teaching methods:

– lecture
– laboratory class
– project

Form of assessment:

Form: Writing exam

Condi-tions: Exam - pass all parts of this subject and positive note from the test

Basic references:

N.F. Gray, Water Technology (Third Edition) An Introduction for Environmental Scientists and
[1] Engineers,Taylor & Francis 2012
[2] Nicholas P. Cheremisinoff, Handbook of Water and Wastewater Treatment Technologies, Elsevier Inc 2002

Additional references:

[1] Guidelines for drinking-water quality, third edition. World Health Organization.

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Head of the organizational unit
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Dean of Mechanical Faculty
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