

The title of course	Chemistry for Civil Engineering (no. 1/I_21/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lecture, 15 h
Language of instruction	English
The number of ECTS	3
Teacher	Monika Basiura-Cembala, PhD
The aims of the course (maximum 500 characters)	The aim of the course is to provide the basic concept of chemistry and systematic information inevitable to students to grasp principles of chemical sciences and understand relationships between building materials properties and their chemical and mineralogical composition.
The content of the course: main topics and key ideas	Topics include: <ul style="list-style-type: none"> • Structure of atoms. Atomic nucleus; radioactivity, radon in buildings. Electron shell of atoms. Chemical bonds and intermolecular forces. • States of matter. Colloids. • Thermochemistry. Heat evolution in chemical reactions of building materials. • Chemistry of water and water solutions. • Chemistry of inorganic building materials. • Degradation of concrete and metals. • Basics of electrochemistry. • Basics of polymer science.
Didactic methods	Multimedia presentation
Course requirements	Written exam
Literature (basic and supplementary)	<i>Basic:</i> <ol style="list-style-type: none"> 1. "Inorganic Chemistry" by Shriver & Atkins 2. "Physicaal chemistry" by Peter Atkins and Julio de Paula <i>Supplementary:</i> <ol style="list-style-type: none"> 1. "Cement and Concrete Chemistry" by Wieslaw Kurdowski

<p>The effects of education</p> <ul style="list-style-type: none"> - Knowledge - Skills - Social competences 	<p><i>Knowledge:</i></p> <ul style="list-style-type: none"> ▪ Understand the process of chemical bonding; ▪ Identify the intramolecular forces that can exist between atoms within a chemical compound or molecule and the intermolecular forces that occur between molecules; ▪ Describe and compare the properties of gases, liquids and solids; ▪ Demonstrates knowledge of reaction energies, equilibrium, and Le Chatelier's principle as applied in chemical reactions ▪ Understand the main reactions between the different cement minerals and water; <p><i>Skills:</i></p> <ul style="list-style-type: none"> ▪ Solve quantitative problems (stoichiometric) involving chemical formulas and equations; <p><i>Social competences:</i></p> <ul style="list-style-type: none"> ▪ The student understands the importance of chemistry as the integral part of society and environment.
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The title of course	Polymer Physics (no. 2/I_21/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lecture, 15 h
Language of instruction	English
The number of ECTS	3
Teacher	Monika Basiura-Cembala, PhD
The aims of the course (maximum 500 characters)	The aims of this course are: <ul style="list-style-type: none"> · to provide introductory level of the theoretical foundations of structure-property relationships in solid polymers and polymer blends; · to provide explanations of how to extract microstructural information from x-ray diffraction /scattering data.
The content of the course: main topics and key ideas	This course introduces polymer physics and its applications in engineering. Topics include: <ul style="list-style-type: none"> · conformation and molecular dimensions of polymer chains in solutions, melts, blends, and block copolymers; · an examination of the structure of glassy, crystalline, and rubbery elastic states of polymers; · thermodynamics of polymer solutions, blends, crystallization and phase separation. · the course also addresses experimental methods for the study of structure via x-ray scattering methods as an integral component of polymer physics.
Didactic methods	Multimedia presentation
Course requirements	Seminar paper

<p>Literature (basic and supplementary)</p>	<p><i>Basic:</i> 1. "Polymer Physics" by Ulf Gedde 2. "Introduction to polymer physics" by David Bower <i>Supplementary:</i> 1. "The Physics of Polymers: Concept for Understanding Their Structures and Behavior" by Gert Strobl 2. "Methods of X-ray and Neutron Scattering in Polymer Science" by Ryong-Joon Roe</p>
<p>The effects of education</p> <ul style="list-style-type: none"> - Knowledge - Skills - Social competences 	<p><i>Knowledge:</i> The student has general knowledge on macromolecular structure – polymer property relationship. <i>Skills:</i> The student analyzes x-ray diffractograms of different polymers <i>Social competences:</i> The student understands the impact of polymers on society.</p>

The title of course	X-ray Scattering Methods in Material Science (no. 3/I_21/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lecture, 15h
Language of instruction	English
The number of ECTS	3
Teacher	Monika Basiura-Cembala, PhD
The aims of the course (maximum 500 characters)	This course explains x-ray diffraction and related phenomena in a context that leads to an understanding of how x-ray methods are presently being used at synchrotrons and x-ray tube sources to determine structural properties of materials.
The content of the course: main topics and key ideas	<p>Topics include:</p> <ul style="list-style-type: none"> • fundamentals of x-ray diffraction /scattering; • sources of X-rays; • single crystal and powder diffraction methods; • wide- and small angle x-rays scattering (WAXS/SAXS) methods; • scattering by non-crystalline solids; • common methods for microstructure analysis as quantification of texture, evaluation of internal stresses and strains and line profile analysis; • interpretation of the position of diffraction peaks and the diffracted intensity; • real and reciprocal space constructions of the conditions for diffraction;
Didactic methods	Multimedia presentation
Course requirements	Seminar paper

<p>Literature (basic and supplementary)</p>	<p><i>Basic:</i></p> <ol style="list-style-type: none"> 1. "X-Ray Diffraction Procedures: For Polycrystalline and Amorphous Materials" by Harold Klug and Leroy Alexander 2. Applications of Synchrotron Radiation to Materials Analysis" by H. Saisho and Y. Gohshi <p><i>Supplementary:</i></p> <ol style="list-style-type: none"> 1. "X-ray diffraction in crystals, imperfect crystals and amorphous bodies" by Andre Guinier 2. "Small angle scattering by X-rays" by Andre Guinier and Gerard Fournet
<p>The effects of education</p> <ul style="list-style-type: none"> - Knowledge - Skills - Social competences 	<p><i>Knowledge:</i></p> <ul style="list-style-type: none"> • The student has general knowledge about the different x-ray scattering techniques with focus on a chosen special application; • The student knows the differences between laboratory x-ray equipment and synchrotron sources; <p><i>Skills:</i></p> <ul style="list-style-type: none"> • The student presents and discuss results of measurements with laboratory equipment or from synchrotron experiments based on literature or own data. <p><i>Social competences:</i></p> <ul style="list-style-type: none"> • The student understands how X-rays affect the human body.

The title of course	Clothing Technology (no. 4/I_21/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lectures/ 15 hours
Language of instruction	English
The number of ECTS	3
Teacher	Monika Bogusławska-Bączek, PhD
The aims of the course (maximum 500 characters)	The aim of the course is to familiarize students with the construction of garments from the point of view of their technology as well as to familiarize with the technological and materials design and familiarization with the principles of technological methods and lines designing.
The content of the course: main topics and key ideas	Primary issues related to clothing technology. Designing sewing connections. Design of technological knots. Selection and optimization of process in clothing. Block design methods. Technological graphs in clothing technology. A chronological procedures and assemble process for selected garments. Apparel production systems.
Didactic methods	Lecture with multimedia presentation
Course requirements	written exam and multimedia presentation
Literature (basic and supplementary)	H. Eberle, H. Hermeling and more, "Clothing Technology - from fibre to fashion" Verlag Europa - Lehrmittel, 2002 Kapsali, Veronika and Dunamore, P. (2008) <i>Biomimetic principles in clothing technology</i> . In: Biologically Inspired Textiles. Woodhead Publishing in Textiles. Woodhead Publishing Limited, Boca Raton, FL, USA, ISBN 9781845692476 Fibres & Textiles in Eastern Europe Journal of Clothing Technology
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> - At the end of the learning process the student is able to describe the construction of garments from the point of view of production technology, describe the methods and techniques of

	<p>process design in some article of clothing, demonstrate basic methods and techniques for the design of technological graphs of clothing.</p> <p><i>Skills:</i></p> <ul style="list-style-type: none">- At the end of the learning process the student is able to communicate using the techniques and symbols used in clothing technology , design and execute technology knots used in clothing, develop a mounting scheme for selected garments and perform on the basis the garment <p><i>Social competences:</i></p> <ul style="list-style-type: none">- At the end of the learning process the student is able to correctly identify and resolve the dilemmas associated the clothing profession
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The title of course	Computer Systems CAD/CAM In Clothing Design (no. 5/I_21/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lectures/ 15 hours
Language of instruction	English
The number of ECTS	2
Teacher	Monika Bogusławska-Bączek, PhD
The aims of the course (maximum 500 characters)	The aim of the course is to familiarize students with the possibilities and scope of the use of computer systems CAD/CAM in the design and manufacturing process of production garments in apparel industries. During the lecture will be discussed the computer systems used in various stages of preparation of production. It will be also presented CAD/CAM systems offered by the most well-known companies in the domestic and global market.
The content of the course: main topics and key ideas	Characteristics of the technological process of clothing. History of computing facilities in apparel industry. Characteristics of computer systems of leading companies to aid the preparation of production and manufacturing products in the clothing industry. Characteristics of professional software modules designed to the preparation of the clothing production Characteristics of planning and rationalization cutting systems of clothing materials. Automatic systems of organizations planning process. Computerization and automation of machinery and equipment in the garment industry.
Didactic methods	Lecture with multimedia presentation
Course requirements	written exam and multimedia presentation
Literature (basic and supplementary)	A. Kusiak „Intelligent systems in design and manufacturing”, ed. Cihan H. Dagli, New York, 1994

	<p>M Stott, „Pattern cutting for clothing using CAD., Woodhead Publishing Series in Textiles“ No. 137 Fibres & Textiles in Eastern Europe Journal of Clothing Technology</p>
<p>The effects of education</p> <ul style="list-style-type: none"> - Knowledge - Skills - Social competences 	<p><i>Knowledge:</i></p> <ul style="list-style-type: none"> - At the end of the learning process the student is able to characterize the possible of using the computer systems CAD/CAM in designing and manufacturing process of garments, list and describe clothing computer systems CAD/CAM designed by leading companies and characterize the range of machinery and equipment computerization in the clothing industry. <p><i>Skills:</i></p> <ul style="list-style-type: none"> - At the end of the learning process the student is able to develop the design and technological documentation in the selected computer systems <p><i>Social competences:</i></p> <ul style="list-style-type: none"> - At the end of the learning process the student is able to think and act in a creative and enterprising

The title of course	Project of The Computer Systems CAD/CAM In Clothing Design (no. 6/I_21/ P /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Project / 15 hours
Language of instruction	English
The number of ECTS	1
Teacher	Monika Bogusławska-Bączek, PhD
The aims of the course (maximum 500 characters)	The aim of the project exercises is to familiarize the student with the support of computer systems CAD / CAM designed to support processes of clothing design, preparation of production and development of manufacturing technology of clothing.
The content of the course: main topics and key ideas	Development of clothing documentation, included drawing of collection, suit of construction's patterns, grading patterns and markers, using the computer systems: Audaces Idea (modules: Creare, Teca, Engine, Doc, Midia) and Audaces Apparel (PDS modules, GRADE and MARKER) of the company Audaces Fashion Technology.
Didactic methods	Interactive classes in the computers room, during which students according to the instructions and with teacher perform exercises and made the documentation of clothing
Course requirements	Attendance and made the final documentation of the garment.
Literature (basic and supplementary)	A. Kusiak „Intelligent systems in design and manufacturing”, ed. Cihan H. Dagli, New York, 1994 M Stott, „Pattern cutting for clothing using CAD., Woodhead Publishing Series in Textiles” No. 137 Fibres & Textiles in Eastern Europe Journal of Clothing Technology
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> - At the end of the learning process the student is able to characterize the possible of using the computer systems CAD/CAM in designing and manufacturing process of garment. <i>Skills:</i> - At the end of the learning process the student is able to develop design and

	<p>technological documentation in the selected computer systems.</p> <p><i>Social competences:</i></p> <ul style="list-style-type: none">- At the end of the learning process the student is able to think and act in a creative and enterprising.
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The title of course	Laboratory of The Clothing Technology (no. 7/I_21/ L/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Laboratory workshop/ 15 hours
Language of instruction	English
The number of ECTS	2
Teacher	Monika Bogusławska-Bączek, PhD
The aims of the course (maximum 500 characters)	The aim of the course is to familiarize the student with the construction of the basic sewing stitches and seams, design and technology of technical knots used in garments, and some basic technology of garments.
The content of the course: main topics and key ideas	Analysis of the sewing stitches and seams. Designing technology knots. Designing of the chronological procedures and technological operations for the selected garments. Development of the assembly scheme for selected garments. Analysis of the structural construction of clothing. Development of graphs of connection structural groups of clothing.
Didactic methods	Interactive workshop classes during which students with the teacher implement the next stages of the project
Course requirements	Attendance, assessment of the reports of group exercises and a self-assessment made by the student exercises.
Literature (basic and supplementary)	H. Eberle, H. Hermeling and more, "Clothing Technology - from fibre to fashion" Verlag Europa – Lehrmittel, 2002 Kapsali, Veronika and Dunamore, P. (2008) <i>Biomimetic principles in clothing technology</i> . In: Biologically Inspired Textiles. Woodhead Publishing in Textiles . Woodhead Publishing Limited, Boca Raton, FL, USA, ISBN 9781845692476 Fibres & Textiles in Eastern Europe Journal of Clothing Technology
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> - At the end of the learning process the student is able to describe the construction of garments from the point of view of production technology,

	<p>describe the methods and techniques of process design in some article of clothing, demonstrate basic methods and techniques for the design of technological graphs of clothing.</p> <p><i>Skills:</i></p> <ul style="list-style-type: none">- At the end of the learning process the student is able to communicate using the techniques and symbols used in clothing technology , design and execute technology knots used in clothing, develop a mounting scheme for selected garments and perform on the basis the garment. <p><i>Social competences:</i></p> <ul style="list-style-type: none">- At the end of the learning process the student is able to correctly identify and resolve the dilemmas associated the clothing profession.
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The title of course	Structure of Garment (no. 8/I_21/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lectures / 15 hours
Language of instruction	English
The number of ECTS	2
Teacher	Monika Bogusławska-Bączek, PhD
The aims of the course (maximum 500 characters)	The aim of the course is to familiarize students with the art, material and technological design process and with the construction of historical and contemporary clothing in terms of its materials structure, composition and technology.
The content of the course: main topics and key ideas	Classification of the assortments of clothing and useful properties. Principles of art design and art elements in clothing forms. Modern forms and styles in clothing. Optimization of the quality of clothing. Durability of clothing. Criteria for selection of clothing materials with additional and other clothing materials. Technological designing of clothes. Construction of basic structures of garments. Technological and organization methods in garment design.
Didactic methods	Lecture with multimedia presentation
Course requirements	written exam and multimedia presentation
Literature (basic and supplementary)	H. Eberle, H. Hermeling and more, "Clothing Technology - from fibre to fashion" Verlag Europa - Lehrmittel, 2002 H. Pepin, "Historical and Modern Pattern Design", Published by Funk & Wagnalls Company, 1942 Helen Joseph-Armstrong, „Draping for Apparel Design" (2nd Edition) Fibres & Textiles in Eastern Europe Journal of Clothing Technology
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> - At the end of the learning process the student is able to determine the principles and methods of a art material and technological design clothes and describe the criteria for selection of clothing

	<p>materials and sewing accessories for garments.</p> <p><i>Skills:</i></p> <ul style="list-style-type: none">- At the end of the learning process the student is able to identify and analyze the useful and exploitation properties as well as he is able to design the necessary documentation of preparing clothing. <p><i>Social competences:</i></p> <ul style="list-style-type: none">- At the end of the learning process the student is able to properly identify and resolve the dilemmas associated with the clothing profession and to think and act in a creative and enterprising
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The title of course	Laboratory of The Structure of Garment (no. 9/I_21/ L/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Laboratory workshop/ 15 hours
Language of instruction	English
The number of ECTS	2
Teacher	Monika Bogusławska-Bączek, PhD
The aims of the course (maximum 500 characters)	The aim of the course is to familiarize the student with the methodology and rules for documentation arts, materials and technological exercised in the design of clothing.
The content of the course: main topics and key ideas	Development of the art, material and technological documentation for the garment. The documentation includes: Product description and collection drawings. Determination of indicators of quality of the designed clothing. Selection of basic materials: color, pattern, material, characteristics of structure parameters of construction and properties. Selection of additional materials and trimmings. Optimizing the construction of the planned structural clothing. Selection of technological solutions. The division technological process for operations and selection of machines and equipment.
Didactic methods	Interactive workshop classes during which students with the teacher implement the next stages of the project
Course requirements	Attendance, assessment of the reports of group exercises and a self-assessment made by the student exercises.
Literature (basic and supplementary)	H. Eberle, H. Hermeling and more, "Clothing Technology - from fibre to fashion" Verlag Europa - Lehrmittel, 2002 H. Pepin, "Historical and Modern Pattern Design", Published by Funk & Wagnalls Company, 1942 Helen Joseph-Armstrong, „Draping for Apparel Design" (2nd Edition) Fibres & Textiles in Eastern Europe Journal of Clothing Technology
The effects of education - Knowledge	<i>Knowledge:</i>

<ul style="list-style-type: none"> - Skills - Social competences 	<ul style="list-style-type: none"> - At the end of the learning process the student is able to determine the principles method of design structures of garments. He has knowledge of primary and additional materials used for clothing. He knows the method of technological design garment. <p><i>Skills:</i></p> <ul style="list-style-type: none"> - At the end of the learning process the student is able design and make clothing inspired by selected elements and use a variety of design methods, modeling and technology of garments. <p><i>Social competences:</i></p> <ul style="list-style-type: none"> - At the end of the learning process the student is able to properly identify and resolve the dilemmas associated with the clothing profession and to think and act in a creative and enterprising
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The title of course	Principle of Clothing (no. 10/I_21/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lectures/ 15 hours
Language of instruction	English
The number of ECTS	4
Teacher	Monika Bogusławska-Bączek, PhD
The aims of the course (maximum 500 characters)	The aim of the course is to familiarize students with the basic types of clothing, with the functions and useful properties of garments and with the basic stages of the design and technology of clothing
The content of the course: main topics and key ideas	The basic information about clothing. The functionality and useful properties of clothing. The role of clothing in designing the microclimate in layers around the body skin. Technological, material, technical and organizational preparation of apparel production. Basic concepts of processes: spreading, cutting, adhesive joining and sewing. Construction, classification and application of sewing machine's stitches and seams. Classification, characterization and application of basic sewing machines. Characteristics of the basic mechanisms of forming a stitch. The process of heat treatment, forming and finishing garments.
Didactic methods	Lecture with multimedia presentation
Course requirements	written exam and multimedia presentation
Literature (basic and supplementary)	H. Eberle, H. Hermeling and more, "Clothing Technology - from fibre to fashion" Verlag Europa – Lehrmittel, 2002 G. Cooklin, St. G. Hayes , and more, „Cooklin's Garment Technology for Fashion Designers", ISBN-10: 1405199741, J. Wiley & Sons Ltd, UK, 2002 Fibres & Textiles in Eastern Europe Journal of Clothing Technology
The effects of education - Knowledge - Skills	<i>Knowledge:</i> - At the end of the learning process the student is able to determine the main

<p>- Social competences</p>	<p>properties of clothing, determine the effect on the microclimate of clothing and describe the basic processes and methods of the production of clothing.</p> <p><i>Skills:</i></p> <ul style="list-style-type: none"> - At the end of the learning process the student is able to classify clothing and selection of its properties. He is also able to define the process of preparation of production as well as he is able to choose of the proper assembly process to clothes <p><i>Social competences:</i></p> <ul style="list-style-type: none"> - At the end of the learning process the student is able to interact and work in a group taking in the different roles.
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The title of course	Laboratory of The Principle of Clothing (no. 11/I_21/ L/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Laboratory workshops/ 15 hours
Language of instruction	English
The number of ECTS	3
Teacher	Monika Bogusławska-Bączek, PhD
The aims of the course (maximum 500 characters)	The aims of laboratory is to familiarize the student with the methods to perform basic anthropometric measurements, design and modeling of the basic forms of clothing and with basic operation of sewing machines
The content of the course: main topics and key ideas	Anthropometric analysis of the human figure. The constructing of the basic forms of clothing. Modeling forms of clothing for fancy garments. Grading of basic pattern of clothing. Design and optimization of markers. Analysis of the process of cutting clothing materials. Analysis of the basic parameters of stitches. Sewing machines – main mechanisms. Sewing the basic clothing.
Didactic methods	Laboratory - interactive classes, during which students according to the instructions and with teacher perform exercises
Course requirements	Attendance, assessment of the reports of group exercises and a self-assessment made by the student exercises.
Literature (basic and supplementary)	H. Eberle, H. Hermeling and more, "Clothing Technology - from fibre to fashion" Verlag Europa – Lehrmittel, 2002 G. Cooklin, St. G. Hayes , and more, „Cooklin's Garment Technology for Fashion Designers", ISBN-10: 1405199741, J. Wiley & Sons Ltd, UK, 2002 Fibres & Textiles in Eastern Europe Journal of Clothing Technology
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> - At the end of the learning process the student is able to determine the number and kind of necessary anthropometric measurements to perform the clothing. He knows the method of construct and

	<p>modeling forms of clothing. He knows the basic sewing machines.</p> <p><i>Skills:</i></p> <ul style="list-style-type: none">- At the end of the learning process the student is able to perform basic anthropometric measurements, construct and model the basic forms of clothing, use the basic sewing. <p><i>Social competences:</i></p> <ul style="list-style-type: none">- At the end of the learning process the student is able to interact and work in a group taking in the different roles.
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The title of course	Special Clothing (no. 12/I_21/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lectures / 15 hours
Language of instruction	English
The number of ECTS	2
Teacher	Monika Bogusławska-Bączek, PhD
The aims of the course (maximum 500 characters)	The aim of the course is to acquaint the student with the assortment, application, structure, properties and technology of special clothing. The aim of the practical course is to develop by the student the documentation of project for the special kind of garment, taking into account the standards and regulations in the range the requirements of these garments.
The content of the course: main topics and key ideas	Assortments and classification of special clothing. Requirements and functional properties of special clothing depending on the purpose and function. Design features, materials technology and determining the functionality of special clothing. Special garments as personal protection. Hazard identification and determination of occupational risks for personal protection. Development of the art, material and technological project of selected special clothing, taking into account the standards and regulations in the range the requirements of this garment.
Didactic methods	Lecture with multimedia presentation
Course requirements	Written exam
Literature (basic and supplementary)	H. Eberle, H. Hermeling and more, "Clothing Technology - from fibre to fashion" Verlag Europa - Lehrmittel, 2002 R Scott , Textiles for Protection, 1st Edition, Woodhead Publishing, ISBN: 9781845690977, 2005 Wang & Gao Protective Clothing, Managing Thermal Stress, 1st Edition, 2014 Fibres & Textiles in Eastern Europe Journal of Clothing Technology

<p>The effects of education</p> <ul style="list-style-type: none"> - Knowledge - Skills - Social competences 	<p><i>Knowledge:</i> At the end of the learning process the student is able to:</p> <ul style="list-style-type: none"> - present the classification of special clothing; - describe the special clothing requirements from the point of view of its purpose and function; - describe the basic properties for different types of special clothing. <p><i>Skills:</i> At the end of the learning process the student is able to:</p> <ul style="list-style-type: none"> - carry out the selection of materials and accessories for the selected assortment of special clothing - identify requirements and occupational hazards for the selection of clothing - design and prepare documentation for special clothing <p><i>Social competences:</i> At the end of the learning process the student is able to interact and work in a group taking in the different roles.</p>
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The title of course	Project of the Special Clothing (no. 13/I_21/ P /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/summer
The form of classes and number of hours	Project / 15 hours
Language of instruction	English
The number of ECTS	1
Teacher	Monika Bogusławska-Bączek, PhD
The aims of the course (maximum 500 characters)	The aim of the course is to acquaint the student with the assortment, application, structure, properties and technology of special clothing. The aim of the practical course is to develop by the student the documentation of project for the special kind of garment, taking into account the standards and regulations in the range the requirements of these garments.
The content of the course: main topics and key ideas	Assortments and classification of special clothing. Requirements and functional properties of special clothing depending on the purpose and function. Design features, materials technology and determining the functionality of special clothing. Special garments as personal protection. Hazard identification and determination of occupational risks for personal protection. Development of the art, material and technological project of selected special clothing, taking into account the standards and regulations in the range the requirements of this garment.
Didactic methods	Interactive classes, during which students with the teacher's help realize each stages of the project.
Course requirements	Evaluation of documentation realized in the writing form and as a multimedia presentation.
Literature (basic and supplementary)	H. Eberle, H. Hermeling and more, "Clothing Technology - from fibre to fashion" Verlag Europa – Lehrmittel, 2002 R Scott , Textiles for Protection, 1st Edition, Woodhead Publishing, ISBN: 9781845690977, 2005

	Wang & Gao Protective Clothing, Managing Thermal Stress, 1st Edition, 2014 Fibres & Textiles in Eastern Europe Journal of Clothing Technology
<p>The effects of education</p> <ul style="list-style-type: none"> - Knowledge - Skills - Social competences 	<p><i>Knowledge:</i> At the end of the learning process the student is able to:</p> <ul style="list-style-type: none"> - describe the special clothing requirements from the point of view of its purpose and function; - describe the basic properties for different types of special clothing. <p><i>Skills:</i> At the end of the learning process the student is able to:</p> <ul style="list-style-type: none"> - identify requirements and occupational hazards for the selection of clothing - design and prepare documentation for special clothing <p><i>Social competences:</i> At the end of the learning process the student is able to interact and work in a group taking in the different roles.</p>

The title of the course	Fibre science (lecture) (no. 14/I_21/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lectures/ 15 hours
Language of instruction	English
The number of ECTS	3
Teacher	Assoc. Prof. Jan Broda
The aims of the course (maximum 500 characters)	The aim of the course of Fibre science is to familiarize students with the fundamental knowledge relating to fibres used in textile industry, especially methods of their obtaining, their structure, properties and application. The course of Fibre science provides essential base for other courses on textile engineering.
The content of the course: main topics and key ideas	Definition and classification of fibres. The molecular and supermolecular structure of fibres. Electrical and thermal properties of fibres. The mechanical properties of fibres – deformability and strength. Cotton – growth, degree of maturity, chemical composition, morphology and properties. Bast fibres (hemp, flax, jute) - stem structure, fibres properties and application. Animal fibres. Origins and morphology of wool. Properties and application of wool. Production, structure and properties of silk. Viscose fibres – structure, properties and application. Formation of synthetic fibres. Structure and properties of synthetic fibres.
Didactics methods	Lecture and multimedia presentation
Course requirements	Exam
Literature (basic and supplementary)	1. M. Lewin: Handbook of fiber chemistry 2. R. Mather, R.Wardman: The Chemistry of Textile Fibers RSC Publishing 2011 3. R. Franck: Silk, mohair, cashmere and other luxury fibers, CRC Woodhead Publishing 2001
The effects of the education - knowledge - skills - social competences	Student is able: - to present the classification of fibres - to describes fibres structure and properties - to identify fibres - to track and understand the lecture

The title of the course The title of the course	High-performance fibres (no. 16/I 21/ L/S /W2)¹RY (no. 15/M 21/ L/E /W2)
Faculty Faculty	Faculty of Materials, Civil and Environmental Faculty of Materials, Civil and Environmental Engineering
The level of studies The level of studies	Undergraduate (BA), Engineer (BSc), Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester Semester	Winter/Summer Winter/Summer
The form of classes and number of hours The form of classes and number of hours	Lectures/ 15 hours Laboratory/ 15 hours
Language of instruction Language of instruction	English English
The number of ECTS The number of ECTS	3 2
Teacher Teacher	Assoc. Prof. Jan Broda Assoc. Prof. Jan Broda
The aims of the course The aims of the course (maximum 500 characters) (maximum 500 characters)	The aim of the course is to familiarize students with the structure and properties of high-performance fibres used in the production of technical and special purpose textiles. The aim of the course is to familiarize students with the fundamental knowledge relating to fibres used in textile industry and to acquire the skills to identify fibres. The course provides essential base for other courses on textile engineering.
The content of the course: main topics and key ideas	Modification of natural fibres: Bamboo fibres. Physical and chemical modification of man-made fibres: Micro and nanofibres – formation, properties and application. Special synthetic fibres: Kevlar and Lycra. Fibres from renewable raw materials – polyactide. Carbon fibres formation, structure and properties. Viscose fibres. Synthetic fibres – polyamide, polyester, polyacrylonitrile and polypropylene. Glass and basalt fibres. Ceramic fibres. Conductive polymers and conductive fibres – polyaniline. Composite fibres.
The content of the course: main topics and key ideas	Identification of natural fibres. Viscose fibres. Synthetic fibres – polyamide, polyester, polyacrylonitrile and polypropylene. Identification of synthetic fibres. Fibres orientation, birefringence. Composite fibres.
Bidactics methods	Laboratory Lecture and multimedia presentation
Course requirements	Test Exam
Literature (basic and supplementary)	1. M. Lewin: Handbook of fiber chemistry 2. R. Mather, R. Wardman: The Chemistry of Textile Fibers RSC Publishing 2011 3. J.W.S. Heane: High Performance Fibres luxury fibres, CRC Woodhead Publishing 2001
The effects of the education The effects of the education - knowledge - skills - social competences	Student is able: - to present the classification of high-performance fibres - to describes fibres properties - to identify fibres - to describe production methods, structure and properties of high-performance fibres
- skills - social competences	- to identify fibres - to track and understand the lecture

The title of course	Biomimetics (no. 17/I_21/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc)/Postgraduate (MA) - all
Semester	Winter/Summer - both
The form of classes and number of hours	Lecture 15h
Language of instruction	English
The number of ECTS	3
Teacher	Monika Rom, PhD
The aims of the course (maximum 500 characters)	As the biomimetic refers to human-made processes, substances, devices, or systems that imitate nature, the aim of the course is to give the student the overview of the wide possibilities of applications of biomimetics in different sectors/industries such as chemistry, nanotechnology, the medical industry, the military and textile industry.
The content of the course: main topics and key ideas	<ol style="list-style-type: none"> 1. The term of biomimetics and areas of applications 2. Biologic surfaces and functions 3. Self organization and hierarchical structures in nature, polymer and hybrid structures 4. Superhydrophobicity and self cleaning materials, including textiles 5. Adhesion and adhesive materials 6. Self-healing materials 7. Ultra-high tenacity materials and fibres 8. Isolation and protection from cold 9. Tissue engineering and synthetic muscles
Didactic methods	Lectures with presentations, discussion
Course requirements	Basic knowledge of chemistry
Literature (basic and supplementary)	<p>Biomimicry: Innovation Inspired by Nature, Benyus Janine. New York, USA: William Morrow & Company;1997</p> <p>Biomimetics: Biologically Inspired Technologies Yoseph Bar-Cohen CRC Press; 2005.</p> <p>Biomimetics: Nature-Based Innovation Yoseph Bar-Cohen, CRC, 2011</p>
The effects of education - Knowledge - Skills - Social competences	<p><i>Knowledge:</i></p> <p>Students are able to study the state of the art on a selected biomimetic application and can explain the working principles and fabrication methods.</p>

	<p><i>Skills:</i> Students can describe the principles of using biology to inspire designs as well as biological mechanisms as models for technology. They can explain how scientists are using experience from nature across many different fields of engineering. They are able to explore nature's solutions for analogous problems when solving an engineering problem.</p> <p><i>Social competences:</i> Students are aware about the possibility of using more ecological systems.</p>
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The title of course	Ceramic processes (lecture) (no. 18/I_21/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lectures 15h
Language of instruction	English
The number of ECTS	2
Teacher	Monika Rom, PhD
The aims of the course (maximum 500 characters)	The aim of the course is to give to student the knowledge and experience on fabrication of ceramics for various application, from the beginning of the process, that is preparation of raw materials, up to finishing of ceramic goods.
The content of the course: main topics and key ideas	<ol style="list-style-type: none"> 1. Raw materials and preparation of raw materials 2. Shaping/fabrication of ceramic materials 3. Drying of ceramics 4. Furnaces for ceramic processes 5. Sintering 6. Finishing of ceramic goods
Didactic methods	Lectures/tutoring with presentations, discussion
Course requirements	Basic knowledge of chemistry, Basic of ceramic materials
Literature (basic and supplementary)	<p>Introduction to metal-ceramic technology, W. Patrick Naylor, 2009</p> <p>Advanced Ceramic Technologies & Products, Springer 2012</p> <p>Ceramic Technology and Processing: A Practical Working Guide (Materials and Processing Technology) Alan G. King, William Andrew Publishing, 2002</p>
The effects of education - Knowledge - Skills - Social competences	<p><i>Knowledge:</i> A student has a knowledge on processes used in the ceramic materials technology. Student knows the physical and chemical aspects of ceramic. A student has the knowledge on factors affecting application properties of the polycrystalline ceramics.</p> <p><i>Skills:</i> A student has the skill to select a ceramic process which is the best one to obtain the established set of application properties of a ceramic material.</p> <p><i>Social competences:</i></p>

	Student is able to gather the knowledge from different sources, such as literature, databases, and use it in the engineering practice.
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The title of course	Ceramic processes (no. 19/I_21/ L/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Summer
The form of classes and number of hours	laboratory 30h
Language of instruction	English
The number of ECTS	3
Teacher	Monika Rom, PhD
The aims of the course (maximum 500 characters)	The aim of the course is to give to student the knowledge and experience on fabrication of ceramics for various application, from the beginning of the process, that is preparation of raw materials, up to finishing of ceramic goods.
The content of the course: main topics and key ideas	Experimental: 1. Fabrication of gypsum mould 2. Rheological properties of ceramic slurries 3. Drying of ceramic mass 4. Formation of glass 5. Compactation of ceramic powders 6. Particle size analysis of ceramic powders.
Didactic methods	Experimental laboratory course
Course requirements	Basic knowledge of chemistry, Basic of ceramic materials, Own protective glasses and apron
Literature (basic and supplementary)	Introduction to metal-ceramic technology, W.Patrick Naylor, 2009 Advanced Ceramic Technologies & Products, Springer 2012 Ceramic Technology and Processing: A Practical Working Guide (Materials and Processing Technology) Alan G. King, William Andrew Publishing, 2002
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> A student has a practical knowledge on processes used in the ceramic materials technology. Student knows the physical and chemical aspects of ceramic. A student has the knowledge on factors affecting application properties of the polycrystalline ceramics. <i>Skills:</i>

	<p>A student has the skill to select a ceramic process which is the best one to obtain the established set of application properties of a ceramic material.</p> <p><i>Social competences:</i> Student is able to gather the knowledge from different sources, such as literature, databases, and use it in the engineering practice.</p>
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The title of course	Polymers (lecture) (no. 20/I_21/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Summer
The form of classes and number of hours	Lectures 15h
Language of instruction	English
The number of ECTS	2
Teacher	Monika Rom, PhD
The aims of the course (maximum 500 characters)	The aim of the course is to give to students the knowledge regarding the most current studies in the area of polymer materials, synthesis, processing and application, base on the current papers from the high quality journals in the topic of polymer materials
The content of the course: main topics and key ideas	The monographic lecture will comprise the most recent information on synthesis, analysis and processing of polymer materials, based on current literature and databases.
Didactic methods	Lecture, discussion
Course requirements	Polymers, polymer processing, organic chemistry
Literature (basic and supplementary)	Papers from: Science direct journals, Springer journals, Taylor-Francis, Wiley and American Chemical Society collections
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> - Students have the knowledge on the current trends and achievements of material engineering in the area of polymer materials. <i>Skills:</i> - Can use scientific literature, data bases and the other sources to apply the results in engineering practice and innovative solutions. <i>Social competences:</i> - Students understand the results of engineering activity and the footprint of this activity on the environment.

The title of course	Polymers (project) (no. 21/I_21/ P /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Summer
The form of classes and number of hours	Project 15h
Language of instruction	English
The number of ECTS	3
Teacher	Monika Rom, PhD
The aims of the course (maximum 500 characters)	The aim of the course is to give to students the knowledge regarding the most current studies in the area of polymer materials, synthesis, processing and application, base on the current papers from the high quality journals in the topic of polymer materials
The content of the course: main topics and key ideas	The project will consist of analysis of possible applications of polymers described in current literature on the polymers, based on processing and properties of described materials.
Didactic methods	case-studies, project
Course requirements	Polymers, polymer processing, organic chemistry
Literature (basic and supplementary)	Papers from: Science direct journals, Springer journals, Taylor-Francis, Wiley and American Chemical Society collections
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> - Students have the knowledge on the current trends and achievements of material engineering in the area of polymer materials. <i>Skills:</i> - Can use scientific literature, data bases and the other sources to apply the results in engineering practice and innovative solutions. <i>Social competences:</i> - Students understand the results of engineering activity and the footprint of this activity on the environment.

The title of course	Organic Chemistry (laboratory) (no. 22/I_21/ L/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc)
Semester	Winter/Summer
The form of classes and number of hours	Laboratory – 15 hours
Language of instruction	English
The number of ECTS	2
Teacher	Beata Fryczkowska, PhD
The aims of the course (maximum 500 characters)	Introduction to the safe and economical operation in the organic chemistry lab. Methods of describing and conducting chemical experiments, compilation of laboratory equipment. Become familiar with selected types of chemical reactions and the associated phenomena.
The content of the course: main topics and key ideas	Introduction to techniques for the purification and separation of organic compounds (crystallization, distillation, extraction). Esterification, condensation, addition, electrophilic substitution (substitution phenols) and nucleophilic (substitution alcohols), oxidation and reduction (Canizzaro reaction), diazotization and coupling reactions (synthesis of pigments) retrieving organic compounds and examining their physical characteristics.
Didactic methods	Carried out in the laboratory synthesis of selected organic compounds.
Course requirements	General chemistry
Literature (basic and supplementary)	Basic literature: – A. I. Vogel, <i>A Text-Book of Practical Organic Chemistry</i>
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> – use proper chemical reaction – define the purpose of the exercise <i>Skills:</i> – carry out chemical experiments in accordance with the safety rules – present the results of the experiment in the form of a report <i>Social competences:</i> – be aware of the risks associated with the use of organic compounds, the need for their responsible use

The title of the course	Water and Wastewater Technology (lecture) (no. 23/I_22/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lectures: 15 h
Language of instruction	English
The number of ECTS	3
Teacher	Assoc. Prof. Bożena Mrowiec
The aims of the course (maximum 500 characters)	Students become familiar with the commonly applied processes (mechanical – physical treatment and chemical treatment) used for water and municipal wastewater treatment.
The content of the course: main topics and key ideas	<p>Lectures:</p> <ol style="list-style-type: none"> 1. Quality characteristics of surface and ground waters - 1h. 2. Basic indicators of water quality – national and EU requirements - 1h. 3. Surface water intake, sewage discharge systems to treatment plants - 1h. 4. Grates and bar screens. Removal processes of grains - grit chambers - 1h. 5. Theoretical principles of suspended solids sedimentation - depending on the hydraulic conditions - 1h. 6. Basic principles of settlers designing - 1h. 7. Coagulation of water and wastewater, processes of colloids destabilization, coagulants used - 2h. 8. Filtration processes and filter types; slow filters; rapid filters; fillings used in gravity and pressure filtration - 1h. 9. Preparation of cooling waters - removal of carbonate hardness, decarbonisation, corrosion, counteraction of the microorganisms growth – 1h. 10. Treatment of boiler feed water: chemical processes of water softening, process conditions, performance, reactions - 1h. 11. Softening and demineralization of water - ion exchange methods: properties of mass ion-exchange properties, effectiveness and process

	<p>conditions, regeneration of ion exchangers, removal of CO₂ - 1h.</p> <p>12. Methods of biological wastewater treatment – selected issues - 2h</p> <p>13. Water and wastewater disinfection; chlorination; ozonation, UV rays - 1 h.</p> <p>14. Summary, revision - 1h.</p>
Didactics methods	Lecture: presentation
Course requirements	Lecture: Exam
Literature (basic and supplementary)	<p><u>Lectures:</u></p> <p>1. Jördening H.J. and Winter J.: Environmental Biotechnology. Concepts and Applications. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, 2005.</p> <p>2. N.F. Gray, Ph.D., Sc.D. An Introduction for Environmental Scientists and Engineers, 2010 Publisher's Note: Transferred to Taylor & Francis as of 2012</p> <p>3. Water Supply. Alan C. Twort, BSc, FICE, FCIWEM, Don D. Ratnayaka, BSc, DIC, MSc, FICHEM E, FCIWEM, and Malcolm J. Brandt, BSc, MICE, MCIWEM</p>
<p>The effects of the education</p> <ul style="list-style-type: none"> - Knowledge - Skills - Social competences 	<p><i>Knowledge:</i></p> <ul style="list-style-type: none"> - can describe and characterize the basic processes of water and wastewater treatment - can explain the design and operation of equipment used for water and wastewater treatment <p><i>Skills:</i></p> <ul style="list-style-type: none"> - can apply methods of natural water and wastewater treatment <p><i>Social competences:</i></p> <ul style="list-style-type: none"> - understand the importance of water and wastewater treatment

The title of the course	Water and Wastewater Technology (laboratory classes) (no. 24/I_22/ L/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Laboratory classes: 15 h
Language of instruction	English
The number of ECTS	3
Teacher	Lucyna Przywara, PhD; Mariusz Kuglarz, PhD
The aims of the course (maximum 500 characters)	Students perform laboratory tests to characterize the quality of water and wastewater as well as evaluate the effectiveness of selected technologies on the basis of studies carried out on model stands.
The content of the course: main topics and key ideas	Laboratories: Introductory classes: health and safety rules, regulations in chemistry laboratory, first aid instructions, the scope and schedule of the course. 1h 1. Coagulation of water (part 1) - determination of optimum dosage of the coagulant and the flocculation time. After familiarizing with the water coagulation process, students determine practically the most appropriate dosage of coagulant (FeCl ₃) and the flocculation time for established (assumed) - optimum pH of the reaction. Analysis of the results achieved - 3h. 2. Coagulation of water (part 2) - determination of the most appropriate pH value ensuring the effective coagulation process. Determination of the optimum pH value of the coagulation (specifically flocculation) based on physical and chemical analysis carried out for the raw and treated water with a given dose of ferric chloride - 3h. 3. Water Softening by means of phosphate method. The hardness of water and the disposal methods. Determination of reagent (sodium phosphate); the effect of temperature on the effectiveness of the process - based on physical and chemical analysis of the raw and treated water - 4h.

	4. Water degassing - de-oxidation by means of sodium sulfite. Introducing students with de-oxidation methods combined with practical eliminating of oxygen by means of chemical method (using sodium sulfite). Assessment of the process effectiveness as regard dosage (excess) used and the initial pH of water - 3h. Final assessment of laboratory classes - 1h.
Didactics methods	Laboratories: performing experiments
Course requirements	Laboratories: attendance, written reports based on knowledge (connected with particular experiments) and performed experiments
Literature (basic and supplementary)	Course materials provided.
The effects of the education - Knowledge - Skills - Social competences	<p><i>Knowledge:</i></p> <ul style="list-style-type: none"> - can explain the design and operation of equipment used for water and wastewater treatment - can justify the selection and calculation of parameters used in equipment for water treatment equipment <p><i>Skills:</i></p> <ul style="list-style-type: none"> - can conduct experiments in lab scale <p><i>Social competences:</i></p> <ul style="list-style-type: none"> - understand the importance of water and wastewater treatment - work independently and as a member of team on the specific research task

The title of the course	Water and Wastewater Technology (project) (no. 25/I_22/ P /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Project: 15 h
Language of instruction	English
The number of ECTS	2
Teacher	Assoc. Prof. Bożena Mrowiec
The aims of the course (maximum 500 characters)	Students become familiar with the commonly applied processes (mechanical - physical treatment and chemical treatment) used for water and municipal wastewater treatment.
The content of the course: main topics and key ideas	Project: 1. Water coagulation - Determination of coagulants dosages and supporting substances based on water quality parameters (2h). 2. Removal of corrosive properties and stabilization of water after coagulation. Determination of calcium dosage binding aggressive carbon dioxide from the water – calculations based on monograms showing calcium carbonate balance in water (2h). 3. Equipment used for sedimentation. Designing of horizontal flow clarifier by means of method based on the surface of the settler and the length of the settler (3h). 4. Equipment used for sedimentation. Designing of vertical flow water clarifiers (2h). 5. Water filtration. Calculating gravity (rapid) filters (2h). 6. Sorption of micro-pollutants. Calculation of height and working time of sorption bed filters in a dynamic system (2h). 7. Credit course: calculation of reagent's dosages, designing of parameters (selected device) according to individual data (2h).
Didactics methods	Project: calculations, team work
Course requirements	Project: attendance, final report (based on calculations)

Literature (basic and supplementary)	<p>1. Jördening H.J. and Winter J.: Environmental Biotechnology. Concepts and Applications. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, 2005.</p> <p>2. N.F. Gray, Ph.D., Sc.D. An Introduction for Environmental Scientists and Engineers, 2010 Publisher's Note: Transferred to Taylor & Francis as of 2012</p> <p>3. Water Supply. Alan C. Twort, BSc, FICE, FCIWEM, Don D. Ratnayaka, BSc, DIC, MSc, FICHEM E, FCIWEM, and Malcolm J. Brandt, BSc, MICE, MCIWEM</p>
The effects of the education - Knowledge - Skills - Social competences	<p><i>Knowledge:</i></p> <ul style="list-style-type: none"> - can explain the design and operation of equipment used for water and wastewater treatment - can justify the selection and calculation of parameters used in equipment for water treatment equipment <p><i>Skills:</i></p> <ul style="list-style-type: none"> - can select and calculate the appropriate the parameters of water and wastewater treatment <p><i>Social competences:</i></p> <ul style="list-style-type: none"> - understand the importance of water and wastewater treatment

The title of course	Biomass and Bioenergy Technologies (no. 26/I_22/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lectures/tutorials 15 hrs
Language of instruction	English
The number of ECTS	3
Teacher	Mariusz Kuglarz, PhD
The aims of the course (maximum 500 characters)	The course provides in-depth knowledge of biomass utilization for energy processes, including: fuel characterisation, treatment and conversion technologies. The course gives insight into different bioenergy technologies (systems), including biopower, biogas, bioethanol and their combinations, with consideration of process integration for energy and heat recovery.
The content of the course: main topics and key ideas	<ol style="list-style-type: none"> 1. Biomass types and characteristics 2. Thermochemical conversion of biomass for energy application 3. Biochemical conversion of biomass for energy application 4. Techno-economic analysis of bioenergy systems 5. Innovative technologies, biorefinery systems.
Didactic methods	Lecture: presentation, seminar: student's presentation
Course requirements	Attendance, seminar with discussion
Literature (basic and supplementary)	<p>Shibu Jose, Thallada Bhaskar. Biomass and Biofuels: Advanced Biorefineries for Sustainable Production and Distribution, 2015 by CRC Press</p> <p>Lijun Wang. Sustainable Bioenergy Production, 2014 by CRC Press.</p> <p>Sergio Capareda. Introduction to Biomass Energy Conversions, 2013 by CRC Press.</p>
The effects of education - Knowledge - Skills - Social competences	<p><i>Knowledge:</i></p> <ul style="list-style-type: none"> - can describe and characterize the basic biomass types - can describe basic thermochemical and biochemical conversion routes <p><i>Skills:</i></p> <ul style="list-style-type: none"> - can explain the equipment design and process conditions of different biomass conversion routes

	<ul style="list-style-type: none">- can analyze bioenergy systems as a whole chain from supply to end users, including technological, environmental, economic aspects. <p><i>Social competences:</i></p> <ul style="list-style-type: none">- understand the importance of energy production from biomass- can work with cross-cutting problems related to bioenergy as a team member
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The title of course	Solid Wastes Management (no. 27/I 22/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engin Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
The level of studies	
Semester	Winter/Summer
The form of classes and number of hours	Lectures/seminars 15hrs
Language of instruction	English
The number of ECTS	3
Teacher	Mariusz Kuglarz, PhD
The aims of the course (maximum 500 characters)	Students become familiar with chosen aspects of solid (municipal and industrial) wastes utilization and management.
The content of the course: main topics and key ideas	<ol style="list-style-type: none"> 1. Waste definition, general background, sources, quantities and composition. 2. Anaerobic digestion, anaerobic digestion of MSW, composting. 3. Incineration. 4. Reuse and recycling. Recycling technologies. 5. Landfill site design and management. 6. Industrial waste complex strategies. 7. Municipal Solid Waste strategies. 8. Solid Waste as a renewable source
Didactic methods	Lecture: presentation, seminar: student's presentation
Course requirements	Attendance, seminar with discussion
Literature (basic and supplementary)	<p>John Pichtel. Waste Management Practices: Municipal, Hazardous, and Industrial, Second Edition, 2014 by CRC Press.</p> <p>Jimmy Alexander Faria Albanese, M. Pilar Ruiz. Solid Waste as a Renewable Resource: Methodologies, 2015 by Apple Academic Press.</p> <p>Frank Kreith, George Tchobanoglous. Handbook of Solid Waste Management. 2002, Mc Graw –Hill.</p>
The effects of education	<p><i>Knowledge:</i></p> <ul style="list-style-type: none"> - can describe and characterize the basic processes of solid wastes treatment - can describe relationships between inappropriate waste management s and impacts on environment <p><i>Skills:</i></p> <ul style="list-style-type: none"> - can explain the design of equipment used for solid wastes treatment - can select an appropriate method of solid wastes treatment <p><i>Social competences:</i></p> <ul style="list-style-type: none"> - understand the importance of wastes disposal and treatment
Knowledge	
Skills	
Social competences	

The title of course	Microbiology (no. 28/I_22/ L/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter
The form of classes and number of hours	Laboratory 15 h
Language of instruction	English
The number of ECTS	3
Teacher	Klaudiusz Grübel, PhD Ewelina Nowicka, MSc Assoc. Prof. Alicja Machnicka
The aims of the course (maximum 500 characters)	Aims and objectives of the subject of Microbiology is to give the graduate the following skills and competences: <ul style="list-style-type: none"> • the ability of an expert to use basic techniques of working microbiologist and the ability to identify and classify selected groups of bacteria; • ability to establish and culturing bacteria; • understanding of the molecular basis of the functioning of organisms prokaryotes; • understand the role of microorganisms in maintaining the biological balance of the environment; • understanding of the possibilities of using microbes in industry and environmental protection, • the ability to interpret the phenomena occurring in the environment under the influence of microorganisms, the use of basic microbiological techniques in practice • students acquire messages in order to understand the role of microorganisms in the environment and basic skills of working with these organisms.
The content of the course: main topics and key ideas	<ul style="list-style-type: none"> • The processes of sterilization and disinfection • Instruments for the observation of microorganisms • Morphology, structure and multiplication of bacteria and fungi • Staining methods of microorganisms • Diagnosis (identification) of microorganisms • Techniques cultures of microorganisms

	<ul style="list-style-type: none"> • Microflora natural environments: soil, water, air • Processes biodegradable of macromolecular compounds • Biological methods of wastewater treatment
Didactic methods	Practice, demonstration, instruction
Course requirements	Biology, chemistry, physics (optics)
Literature (basic and supplementary)	Wastewater Microbiology – G. Bitton Microbiology: laboratory, theory, application - Michael J. Leboffe , Burton E. Pierce
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> student is able to explain the structure and physiological functions of selected groups of microorganisms, student knows the practical possibilities of the use of microorganisms in environmental engineering student knows the health indicators of water quality <i>Skills:</i> student is able to carry out properly the processes of sterilization and disinfection, student is able to perform staining microorganisms, student is able to identify biochemical micro-organisms and their physiological processes <i>Social competences:</i> student is able to interact and work in a group

The title of course	Environmental Chemistry (lecture) (no. 29/I_22/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer – both possible
The form of classes and number of hours	Lecture, 15 h
Language of instruction	English
The number of ECTS	2
Teacher	Mirosław Wyszomirski, Ph D
The aims of the course (maximum 500 characters)	You will study selected topics on the chemistry of the air, water, and soil, as well as the effects of anthropogenic activities on their chemistry. You will also learn about sustainability, organic pollutants and biofuels.
The content of the course: main topics and key ideas	<ul style="list-style-type: none"> ✓ an introduction to the lithosphere and its erosion and pollution; ✓ the chemistry of the atmosphere and its pollution; ✓ the properties of natural waters and their pollution; ✓ organic chemicals and their environmental effects; ✓ biofuels – production, environmental impact.
Didactic methods	Oral lecture, discussion, student's presentation.
Course requirements	Basic general chemistry and physics
Literature (basic and supplementary)	<ol style="list-style-type: none"> 1. Baird C., Cann M., <i>Environmental Chemistry</i>, 5th ed., W. H. Freeman and Company. 2. Mahahan S. E., <i>Fundamentals of Environmental and Toxicological Chemistry</i>, 4th ed, CRC Press.
The effects of education - Knowledge - Skills - Social competences	<p><i>Knowledge:</i> has ability to understand chemical transformations and mass transfer occurring in the environment.</p> <p><i>Skills:</i> knows the methods and their extent to measure important environmental parameters.</p> <p><i>Social competences:</i> can work and cooperate in a group during experimental activities.</p>

The title of course	Environmental Chemistry (laboratory) (no. 30/I_22/ L/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Summer
The form of classes and number of hours	lab experiments, 15 h
Language of instruction	English
The number of ECTS	2
Teacher	Mirosław Wyszomirski, PhD
The aims of the course (maximum 500 characters)	You will study selected topics on the chemistry of the air, water, and soil, as well as the effects of anthropogenic activities on their chemistry. You will also learn about sustainability and organic pollutants.
The content of the course: main topics and key ideas	<ul style="list-style-type: none"> ✓ the chemistry of the atmosphere and its pollution; ✓ the properties of natural waters and their pollution; ✓ organic chemicals and their environmental effects;
Didactic methods	Lab experiments.
Course requirements	Basic general chemistry and physics
Literature (basic and supplementary)	<p>Ibanez J. G. et al., <i>Environmental Chemistry Microscale Laboratory Experiments</i>, Springer.</p> <p>Gopalan R., Anand A., Sugumar R. W., <i>A Laboratory Manual for Environmental Chemistry</i>, IK International, 2008.</p>
The effects of education - Knowledge - Skills - Social competences	<p><i>Knowledge:</i> has ability to understand chemical transformations and mass transfer occurring in the environment.</p> <p><i>Skills:</i> knows the methods and their extent to measure important environmental parameters.</p> <p><i>Social competences:</i> can work and cooperate in a group during experimental activities.</p>

The title of course	Organic Chemistry (lecture) (no. 31/I_22/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc)
Semester	Summer
The form of classes and number of hours	Lecture, 15 h
Language of instruction	English
The number of ECTS	2
Teacher	Mirosław Wyszomirski, Ph D
The aims of the course (maximum 500 characters)	You will study selected topics on relations between electronic and atomistic structures of organic compounds and their properties. You will learn nomenclature of important organic compounds groups.
The content of the course: main topics and key ideas	<ul style="list-style-type: none"> ✓ Electronic structure of organic compounds. ✓ Isomerism. ✓ Main functional groups. ✓ Types of reactions in organic chemistry. ✓ Important groups of organic compounds, nomenclature, synthesis, properties, their impact on the environment.
Didactic methods	Oral lecture, discussion, student's presentation.
Course requirements	Basic general chemistry
Literature (basic and supplementary)	<ol style="list-style-type: none"> 1. Patrick G., <i>Instant Notes. Organic Chemistry</i>, BIOS Scientific Publishers, 2005. 2. Bruice P.Y., <i>Essential Organic Chemistry</i>, 2nd ed., Prentice Hall, 2010.
The effects of education - Knowledge - Skills - Social competences	<p><i>Knowledge:</i> ability in formulating and solving simple problems in organic part of environmental engineering,</p> <p><i>Skills:</i> competence to acquire information from literature, data bases and other; to integrate and interpret it,</p> <p><i>Social competences:</i> knowledge how to work individually and in a group over a specified problem.</p>

The title of course	Hydrobiology and water chemistry (no. 32/I_22/ L/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	laboratory exercises 15 h
Language of instruction	English
The number of ECTS	3
Teacher	Ewa Jachniak, PhD
The aims of the course (maximum 500 characters)	The cognition of plant and animal world of water ecosystem, knowledge of indicators organisms for polluted water and different trophic levels, importance of these organisms in nature and economy, the cognition of eutrophication problems in water ecosystems and acquisition of knowledge allowing for the protection of aquatic ecosystems.
The content of the course: main topics and key ideas	<p>The planktonic algae and the recognition of chosen phytoplankton species (the microscopic observations of different groups of algae, the cognition of species creating water blooms, the realization of microscopic slides and schematic draws together with descriptions by students);</p> <p>The using of algae as bioindicators and other meaning of algae (life meaning and using by people);</p> <p>Waterweeds - the texture of cells and tissues, functions and adaptation (the basic information and the realization of schematic draws of waterweeds (i. a. Elodea canadensis, Nymphaea alba, Lemna sp., Typha sp.) together with descriptions by students, the meaning and using of waterweeds, the using of waterweeds as bioindicators);</p> <p>The review of bottom macroinvertebrate occurring in the streaming and stagnant water (the anatomic and morfologic texture of bottom invertebrate animals, the using of invertebrate bottom animals as bioindicators, the evaluation of trophic state and quality of water ecosystems);</p>

	<p>The application biological methods in the evaluation of the purity of surface water (based on algae, waterweeds and bottom macroinvertebrate);</p> <p>The methodology of taking samples of these water organisms and the methodology of carrying out of analyses (equipment for collecting of the samples, quantitative and qualitative analyses);</p> <p>The biotic and abiotic factors, which influence on a variability of abundance and biomass of water organisms (biotic factors (i. a. competition, pathogens) and abiotic factors (i. a. the strength of irradiance, the temperature, the biogenic substances)).</p>
Didactic methods	The self realization of fresh microscopic slides by students, using solid microscopic slides, the self realization schematic draws of microscopic slides together with descriptions by students, showing water organisms photos and pictures (algae, waterweeds, bottom macroinvertebrate), the interest of students in the broad subject area of the biology of water, by indicating its practical values for nature and people – based on lecture and presentation.
Course requirements	Attendance of the course, discussion with students, the evaluation the exercise reports given by students, the estimation of qualification of conduction and evaluation the biological water analysis, by students.
Literature (basic and supplementary)	<p>The basic literature:</p> <ul style="list-style-type: none"> • Cox E. J.: Identification of Freshwater Diatoms from Live Material. Chapman and Hall, London 1999 • Sigeo D.C., Bellinger E.G.: Freshwater Algae: Identification, Enumeration and Use as Bioindicators (2nd Revised edition), 2015 <p>the supplementing literature:</p> <ul style="list-style-type: none"> • Sardet Ch.: Plankton : Wonders of the Drifting World, Chicago 2015 • Sommer U., Lampert W.: Limnoecology: The Ecology of Lakes and Streams (2nd Revised edition), 2007
The effects of education - Knowledge - Skills	The students can determine the water quality and trophy level by using water organisms. <i>Knowledge:</i>

<p>- Social competences</p>	<p>- knowledge of indicators organisms for polluted water and different trophic levels, knowledge importance of these organisms in nature and economy, the cognition of eutrophication problems in water ecosystems and possibilities of the protection and decreasing trophic of water ecosystems;</p> <p><i>Skills:</i></p> <p>- the students are able to recognize water organisms and using their to evaluation of water quality (as bioindicators);</p> <p><i>Social competences:</i></p> <p>- the students are more aware of the protection our environment for better and healthier life,</p> <p>- the students acquire the skills to work in a group.</p>
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The title of course	Devices and technologies for treatment of biogases (no. 33/I_22/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc)/Postgraduate (MA)
Semester	Summer
The form of classes and number of hours	Lectures 15 h
Language of instruction	English
The number of ECTS	3
Teacher	Assoc. Prof. Jan Cebula
The aims of the course (maximum 500 characters)	Students take a closer look at the treatment of biogases technologies. Will learn with the physical, chemical and biological processes occurring during treatment of biogases.
The content of the course: main topics and key ideas	Lectures: <ol style="list-style-type: none"> 1. Main problems of cleaning biogases used for economic purposes – 2 h 2. Biochemical processes occurring during methane fermentation – 2h 3. Substances, which are useful for biogas production – 1h 4. Characteristic of landfill biogas – 1h 5. Characteristic of agricultural biogas – 2h 6. Technologies removal of sulphur compounds from biogases – 2h 7. Removal of carbon dioxide from biogases – 1h 8. Removal of ammonia from agriculture biogas – 1h 9. Pressure Swing Adsorption methods for upgrading methane – 2h 10. Organic silicon compounds removal from biogas – 1h
Didactic methods	Lecture: presentation
Course requirements	Lecture: exam
Literature (basic and supplementary)	<ol style="list-style-type: none"> 1. L. Kohl, R. B. Nielsen. Gas purification. Elsevier 1997 2. T. Al Seadi, D. Ritz, H. Prassl, M. Kotner, T. Finsterwalder, S. Volk, R. Janssen. Biogas Handbook. Published by University of Southern Denmark Esbjerg. Denmark 2008 3. A. Schnurer, A. Jarvis. Microbiological Handbook for Biogas Plants. Malmo 2009

	4. M. Paterson. V. Kuhn. Guide to Biogas. From production to use. Guzlow 2012
<p>The effects of education</p> <ul style="list-style-type: none"> - Knowledge - Skills - Social competences 	<p><i>Knowledge:</i></p> <ul style="list-style-type: none"> - is able to describe and characterize the processes methane fermentation of organic matter, - can characterize the components of biogas plants, - can describe the types of contaminants occurring in various types of biogases. <p><i>Skills:</i></p> <ul style="list-style-type: none"> - can apply the method of purifying biogases, - can recognize differences in the technologies for producing and purifying biogases. <p><i>Social competences:</i></p> <ul style="list-style-type: none"> - understand the importance of purifying biogases before use.

The title of course	European Union environmental law and management (no. 34/I_22/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lectures (15h)
Language of instruction	English
The number of ECTS	3
Teacher	Andrzej Harat, PhD
The aims of the course (maximum 500 characters)	The course introduces students to the essentials and key factors in planning and implementation of EC`s Environmental law and Management Systems. The aim of course is to teach students to manage with interrelations among the environment, law and management systems. In particular, the students will learn to design environmental strategies that reduce environmental impact, optimise resources use, promote waste reduction and recycling and prevent pollution. Cleaner production as a preventive, company-specific environmental protection initiative will be presented. The Council Directive 96/61/EEC concerning integrated pollution prevention and control (IPPC) will be characterized. Environmental Impact Assessment (EIA) as method which identifies the impacts (both beneficial and adverse) of proposed public and private development activities.
The content of the course: main topics and key ideas	<ol style="list-style-type: none"> 1. Environmental management law system. The management system hierarchy. Policies and Regulations on different levels. Environmental policies classification and description. 2. Fundamentals of International Environmental Law 3. European Environmental Law 4. The harmonisation of the Polish Environmental Protection Law with the law of the European Community 5. Cleaner production 6. IPPC Directive (Integrated Pollution Prevention and Control) 7. International Law of Sustainable Development

	8. The Development of Waste Management Law
Didactic methods	Power point presentation – teaching ex cathedra);
Course requirements	Exam
Literature (basic and supplementary)	<p><i>Basic:</i></p> <ol style="list-style-type: none"> 1. Epstein, M. J.: Making Sustainability Work. Best practices in managing and measuring corporate social, environmental, and economic impacts. Greenleaf Publishing Limited, 2008. 2. Marguglio, B. W.: Environmental Management Systems, ACQC Quality Press, Milwaukee Wisconsin, USA, 1997. 3. Jain, R., Urban, L.W.: Environmental Assessment, 2nd Edition, The McGraw-Hill Companies, 2004. 4. New Tools for Environmental Protection: Education, Information and Voluntary Measures, editors T. Dietz and P. C. Stern, National Academy of Sciences, 2002. 5. Group of Authors, Planning and Environmental Protection – A Review of Law and Policy; Hart Publishing Oxford – Portland Oregon, 2001. <p><i>Supplementary:</i></p> <ol style="list-style-type: none"> 1. Barrow, J. C.: Environmental management. Principles and Practice. Taylor & Francis Group, New York 2002. 2. Barrow, J. C.: Environmental management and Development. Taylor & Francis Group, New York 2005. 3. Singh, B., Theodore, L.: Handbook of Environmental Management and Technology. New York, John Wiley 2000. 4. Friedman, F.: Practical Guide to Environmental Management. Washington, D.C., Environmental Law Institute 2000. 5. Calow, P.(ed.). Encyclopaedia of Ecology & Environmental Management.
The effects of education - Knowledge - Skills - Social competences	<p>After concluding this course the student should be able to:</p> <p><i>Knowledge:</i></p> <ol style="list-style-type: none"> 1. Describe and explain motivations and driving forces behind the development of EMS, and process and product development in companies and organizations; 2. Describe and explain the processes for certification, registration and maintenance of an EMS according to ISO 14001 and EMAS and REACH system.

	<p>3. In a written case study describe, explain and analyse the environmental and sustainability performance of selected company and critically review the goals achieved.</p> <p><i>Skills:</i></p> <ol style="list-style-type: none">1. Implement, maintain and improve an environmental management system.2. Assure itself of its conformance with its own stated environmental policy.3. Ensure compliance with environmental laws and regulations. <p><i>Social competence:</i></p> <ol style="list-style-type: none">1. Understand weigh of environmental requirements, and the environmental education and training.
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The title of course	European Union environmental law and management (no. 35/I_22/ L/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Exercises (15 h)
Language of instruction	English
The number of ECTS	3
Teacher	Andrzej Harat, PhD
The aims of the course (maximum 500 characters)	The course introduces students to the essentials and key factors of ISO 14000 international standards of environmental management, providing a framework for development of both the systems and the supporting audit program will be studied. The student should learn key issues of model PLAN/DO/CHECK/ACT. The Eco-Management and Audit Scheme (EMAS) as a voluntary tool design to improve companies' environmental performance. Also the new EU chemical environmental law system - REACH (Registration, Evaluation, Authorization and Restriction of Chemical substances) will be presented. In particular it would be characterized that REACH is a management system which improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances. The course includes class discussion and a student individual or group project on selected topics.
The content of the course: main topics and key ideas	<ol style="list-style-type: none"> 1. Environmental Impact Assessment (EIA). 2. Introduction to ISO 14001 for the Environmental management systems. The clauses of ISO 14001:2005. Sustainable development. 3. Deming's circle. 4. Environmental audit: scope, selecting the object, planning and performing audit, audit reporting. Environmental self-audit. 5. Study of waste management services: regulations, planning, financing, operating requirements.

	<p>6. Establishing managements system for the maintenance and control of the environmental equipment.</p> <p>7. REACH decree</p> <p>8. International Climate Law</p>
Didactic methods	Power point presentation – teaching ex cathedra, preparing seminar paper)
Course requirements	Seminar paper
Literature (basic and supplementary)	<p><i>Basic:</i></p> <ol style="list-style-type: none"> 1. Epstein, M. J.: Making Sustainability Work. Best practices in managing and measuring corporate social, environmental, and economic impacts. Greenleaf Publishing Limited, 2008. 2. Marguglio, B. W.: Environmental Management Systems, ACQC Quality Press, Milwaukee Wisconsin, USA, 1997. 3. Jain, R., Urban, L.W.: Environmental Assessment, 2nd Edition, The McGraw-Hill Companies, 2004. 4. New Tools for Environmental Protection: Education, Information and Voluntary Measures, editors T. Dietz and P. C. Stern, National Academy of Sciences, 2002. 5. Group of Authors, Planning and Environmental Protection – A Review of Law and Policy; Hart Publishing Oxford – Portland Oregon, 2001. <p><i>Supplementary:</i></p> <ol style="list-style-type: none"> 1. Barrow, J. C.: Environmental management. Principles and Practice. Taylor & Francis Group, New York 2002. 2. Barrow, J. C.: Environmental management and Development. Taylor & Francis Group, New York 2005. 3. Singh, B., Theodore, L.: Handbook of Environmental Management and Technology. New York, John Wiley 2000. 4. Friedman, F.: Practical Guide to Environmental Management. Washington, D.C., Environmental Law Institute 2000. 5. Calow, P.(ed.). Encyclopaedia of Ecology & Environmental Management.
<p>The effects of education</p> <ul style="list-style-type: none"> - Knowledge - Skills - Social competences 	<p>After concluding this course the student should be able to:</p> <p><i>Knowledge:</i></p> <ol style="list-style-type: none"> 1. Describe and explain motivations and driving forces behind the development of EMS, and process and product development in companies and organizations;

	<p>2. Describe and explain the processes for certification, registration and maintenance of an EMS according to ISO 14001 and EMAS and REACH system.</p> <p>3. In a written case study describe, explain and analyse the environmental and sustainability performance of selected company and critically review the goals achieved.</p> <p><i>Skills:</i></p> <ol style="list-style-type: none"> 1. Implement, maintain and improve an environmental management system. 2. Assure itself of its conformance with its own stated environmental policy. 3. Ensure compliance with environmental laws and regulations. <p><i>Social competence:</i></p> <ol style="list-style-type: none"> 1. Understand weigh of environmental requirements, and the environmental education and training.
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The title of the course	Hydrology (no. 36/I_22/ P /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Summer
The form of classes and number of hours	Project 15 h
Language of instruction	English
The number of ECTS	3
Teacher	Marek Madzia, PhD Ewa Suchanek, MSc
The aims of the course (maximum 500 characters)	The aim of the course is to familiarize with the issues and phenomena in the field of hydrology. Provide basic information about resources, circulation and water balance in nature. In addition, students will be familiarized with the calculation methods used to determine the parameters, hydrological characteristics and flow characteristics.
The content of the course: main topics and key ideas	I st project: Calculation parameters of physiographic and geomorphological catchment area (6h): <ol style="list-style-type: none"> 1. appointment border catchment main stream 2. growth profile of the catchment area 3. calculation of catchment physiographic parameters (decrease catchment, the average decrease in slope) 4. the calculation of the average annual flow 5. hydrological profile of the average annual flow II nd project: Determination of flow curve in controlled cross-sectional (4h): <ol style="list-style-type: none"> 1. determination of flow curve by method divided trough 2. determination of flow curve by method averaged roughness coefficient
Didactics methods	Discussion of issues calculation in accordance with the theme of the exercise. Perform calculations by students in part with the help of an Excel spreadsheet and other instruments (AutoCAD, map measurer).
Course requirements	Credit with grade on the basis of assessment with the projects. On the assessment is also affected by systematic work, activity and attendance.

Literature (basic and supplementary)	<ol style="list-style-type: none"> 1. Stream hydrology: an introduction for ecologists", Nancy D. Gordon, Thomas A. McMahon, Brian L. Finlayson 2. Environmental Management of Water Projects" eds. Edward O. Gangstad, Ronald A. Stanley
<p>The effects of the education</p> <ul style="list-style-type: none"> - Knowledge - Skills - Social competences 	<p><i>Knowledge:</i></p> <ul style="list-style-type: none"> - understands the need for hydrological observations and presents the possibility of their use <p><i>Skills:</i></p> <ul style="list-style-type: none"> - knows how to draw a dividing line the catchment and its basic parameters - know how to determination of flow curve in controlled cross-sectional <p><i>Social competences:</i></p> <ul style="list-style-type: none"> - aware of the significance of the use and selection of appropriate calculation methods - can to work in a group by sharing various insights

The title of the course	Water Management (no. 37/I_22/ P /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Summer
The form of classes and number of hours	Project 15 h
Language of instruction	English
The number of ECTS	3
Teacher	Marek Madzia, PhD Ewa Suchanek, MSc
The aims of the course (maximum 500 characters)	The aim of the course is to familiarize with the subject of an action in the field of water management and water conservation. Student gains knowledge in the range: determining disposable resources, water balance of economic, water management facilities, flood protection, legal conditions of water management. In addition, is an acquired practical skill preparing documentation (report on water and law matters).
The content of the course: main topics and key ideas	<ol style="list-style-type: none"> 1. Purpose and scope of water use (1h). 2. The calculation of the guaranteed resources (determination of the catchment area, the profile increase the catchment area; transfer of daily flows from the catchment analog, calculation the guaranteed flows) (4h). 3. Determination of flow inviolable and determination of operating resources in cross water intake (2h). 4. Determination of the capacity of the surge tank (2h). Determine the effect of water management on the surface and determine the protective zones (1h)
Didactics methods	Discussion of issues calculation in accordance with the theme of the exercise. Perform calculations by students in part with the help of an Excel spreadsheet and other instruments (AutoCAD, map measurer).
Course requirements	Credit with grade on the basis of assessment with the project. On the assessment is also affected by systematic work, activity and attendance.
Literature (basic and supplementary)	1. Institutional Aspects of Water Management: Evaluating the Experience eds. Gamini Herath

	2. Water Management and Protection eds. Iwona Skoczko, Janina Piekutin, Łukasz Malinowski
<p>The effects of the education</p> <ul style="list-style-type: none"> - Knowledge - Skills - Social competences 	<p><i>Knowledge:</i></p> <ul style="list-style-type: none"> - performs hydrological documentation (report on water and law matters) <p><i>Skills:</i></p> <ul style="list-style-type: none"> - uses techniques for determining flow: guaranteed, disposable and inviolable - explains the legal conditions of water management <p><i>Social competences:</i></p> <ul style="list-style-type: none"> - aware of the significance of the use and selection of appropriate calculation methods - can to work in a group by sharing various insights

The title of course	General ecology (no. 38/I_22/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lectures/seminars 15hrs
Language of instruction	English
The number of ECTS	3
Teacher	Assoc. Prof. Damian Chmura
The aims of the course (maximum 500 characters)	Students become familiar with chosen aspects, aims and scope of modern ecology.
The content of the course: main topics and key ideas	Definition of ecology and its relationships with other biological sciences and nature conservation. Earth as environment of Earth: origin of universe, solar system and Earth. Forming of biosphere. Biogenesis and history of life on Earth, evolutionary ecology. Autecology: environmental factors, species niche, tolerance to environment. Functional groups of organisms, guilds. Population ecology: types and spatial structure of population, model of population growth. Ecosystems: abiotic and biotic elements of ecological systems at various levels of organization. Definition of biocenosis, community, association. Food webs and trophic pyramids. Biogeochemical cycles.
Didactic methods	Lecture: presentation, seminar: student's presentation
Course requirements	Attendance of the course, seminar with discussion
Literature (basic and supplementary)	Chapin III, F. S., Chapin, M. C., Matson, P. A., & Vitousek, P. (2011). <i>Principles of terrestrial ecosystem ecology</i> . Springer. Townsend, C. R., Begon, M., & Harper, J. L. (2003). <i>Essentials of ecology</i> (No. Ed. 2). Blackwell Science. Jørgensen, S. E. (Ed.). (2009). <i>Ecosystem ecology</i> . Academic press.
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> Student understand relations between environmental factors and functioning of living organisms <i>Skills:</i> Students can indicate and analyze ecological processes. <i>Social competences:</i> Students are aware of environmental problems due to human activity

The title of course	Community ecology (no. 39/I_22/ L/S/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	lecture/laboratory 15 hrs
Language of instruction	English
The number of ECTS	3
Teacher	Assoc. Prof. Damian Chmura
The aims of the course (maximum 500 characters)	The course provides essential knowledge about functioning of biocenoses and methods of their study
The content of the course: main topics and key ideas	Lectures: Introduction to term: ecosystem, biocoenosis, community, assemblage. Clement's concept of climax and Gleason's The Individualistic concept of the plant association. Continuum vs. discontinuum of communities. Structure of biocenoses. Patterns in biocoenoses, assembly rules. Niche model, neutral model and null model of a community. Positive and negative interactions in biocenoses. Dynamics of biocenoses. Types of biocenoses. Methods of study of biocenoses. Concept of phytosociology. Laboratories: performing of phytosociological relevés, data analysis of phytosociological data, performing of synoptic table.
Didactic methods	Lectures, laboratories: fieldwork and analysis of obtained data.
Course requirements	Attendance of course, written reports based on fieldwork and laboratory analysis.
Literature (basic and supplementary)	Schulze ED., Beck E, Müller-Hohenstein K. 2005. <i>Plant Ecology</i> . Springer. Verhoef H., Morin P.J. 2010. <i>Community ecology</i> . Oxford University Press
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> Students understand basic terminology applied in community ecology. <i>Skills:</i> Student can perform phytosociological relevé in the field <i>Social competences:</i> They can cooperate in a group.

The title of course	Biological conservation (no. 40/I_22/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	lecture/laboratory 15 hrs
Language of instruction	English
The number of ECTS	3
Teacher	Assoc. Prof. Damian Chmura
The aims of the course (maximum 500 characters)	The main goal of the course is to provide essential knowledge about types and tools of nature conservation and awareness of environmental problem due to human activity
The content of the course: main topics and key ideas	Relations between nature conservation, nature protection and ecology; History of nature conservation in the world; Motives of nature conservation; Types and directions of nature conservation; Global and European organisations, directives, conventions about nature conservation; Active vs. conservational protection; Protection in situ and ex situ; Strict and partial protection; The types of protection of species The types of area protection; Management of protection areas.
Didactic methods	Lectures
Course requirements	Attendance of the course and student's presentation
Literature (basic and supplementary)	Askins, R. A., Dreyer, G. D., Visgilio, G. R., & Whitelaw, D. M. (2008). <i>Saving biological diversity: balancing protection of endangered species and ecosystems</i> (Vol. 110). Springer.
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> Students understand and can mention various types of nature conservation <i>Skills:</i> Students recognize some protected plants and animals in the place where they come from; <i>Social competences:</i> Student are aware of consequences of human impact on environment and understand needs of nature protection.

The title of course	Land reclamation and restoration using biological methods (no. 41/I_22/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	Lecture/laboratory 15 hrs
Language of instruction	English
The number of ECTS	3
Teacher	Assoc. Prof. Damian Chmura
The aims of the course (maximum 500 characters)	Student become familiar with basics of restoration ecology and tools applied in rehabilitation of degraded ecosystems
The content of the course: main topics and key ideas	Introduction to restoration ecology; Concept of reclamation, reallocation, rehabilitation, bioremediation, revitalization and restoration; Successional theory and its applications for rehabilitation; The case study of post-coal mine subsidence reservoirs; The case study of open cast mines reservoirs; The case study of colliery waste tips.
Didactic methods	Lecture
Course requirements	Attendance of the course and presentation for specified topic concerning the topic of lecture.
Literature (basic and supplementary)	Kangas P.C. (2004) Ecological engineering. Principles and practice. Lewis Publishers. Walker L.R., Moral R. (2003) Primary succession and ecosystem rehabilitation. Cambridge University Press.
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> Students can define types of ecosystem rehabilitation; <i>Skills:</i> Students are able to indicate proper land management aiming at biodiversity protection; <i>Social competences:</i> Students are aware of degradation of environment by humans and understand needs of their reclamation.

The title of course	Biological invasions (no. 42/I 22/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/Summer
The form of classes and number of hours	lecture/laboratory 15 hrs
Language of instruction	English
The number of ECTS	3
Teacher	Assoc. Prof. Damian Chmura
The aims of the course (maximum 500 characters)	Students become familiar with economical, ecological global problem with IAS invasive alien species
The content of the course: main topics and key ideas	Introduction to terminology of synanthropic species: alien, non-native, exotic, invasion, expansion, invasiveness and invasibility; History of concept of invasion, invasion vs. ecological explosion; Famous examples of invasion worldwide, classification of synanthropic plants and animal species. Causes and theories explaining success of alien invasive species: tens rule, residence time, lag-phase, empty niche hypothesis, novel weapon hypothesis, enemy release hypothesis, Darwin's naturalization hypothesis, evolution of increased competitive ability, competitive release hypothesis etc.; Economical problem of existence of IAS, Methods of control and eradication of IAS International regulations, programmes databases concerning IAS
Didactic methods	Lecture
Course requirements	Attendance of the course and presentation for specified topic concerning IAS
Literature (basic and supplementary)	Cadotte, M.W. et al. , eds (2006). Conceptual Ecology and Invasions Biology: Reciprocal Approaches to Nature, Springer. Handbook of Alien Species in Europe Foxcroft, L. C., Pyšek, P., Richardson, D. M., & Genovesi, P. 2013. Plant Invasions in Protected Areas.
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> Students understand and recognize problem of biological invasions <i>Skills:</i> Students can mention harmful invasive species and threat which they can pose <i>Social competences:</i> Student are aware of danger of biological invasions and can share their knowledge with others.

The title of course	Geobotanical cartography (no. 43/I_22/ L/S/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/summer
The form of classes and number of hours	lecture/laboratory 15 hrs
Language of instruction	English
The number of ECTS	3
Teacher	Assoc. Prof. Damian Chmura
The aims of the course (maximum 500 characters)	The main objective is to provide essential knowledge about principles and applications of cartography in nature conservation and botany
The content of the course: main topics and key ideas	Introduction to geobotany and nature conservation; The concept of environmental valorization and expertise; Introduction to mapping and cartography; Types of maps; Chorological and floristical maps; Phytosociological maps; Sozological maps; Ecological and applied ecological maps, Use of GIS for cartography
Didactic methods	Lecture, laboratory
Course requirements	Attendance of the course, student's presentation based on work during laboratories
Literature (basic and supplementary)	Gergel, S. E., & Turner, M. G. (Eds.). (2006). <i>Learning landscape ecology: a practical guide to concepts and techniques</i> . Springer Science & Business Media.
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> Students can recognize and interpret various types of maps applied in nature conservation, <i>Skills:</i> Students can transform geobotanical data into maps, <i>Social competences:</i> Student can cooperate in a group.

The title of course	Numerical ecology (no. 44/I 22/ L/S/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/summer
The form of classes and number of hours	Lectures/laboratories 15 hrs
Language of instruction	English
The number of ECTS	4
Teacher	Assoc. Prof. Damian Chmura
The aims of the course (maximum 500 characters)	Students learn multivariate analyses in community ecology, mainly applied in vegetation sciences. They become familiar with essential and key statistical tools using various software packages in R environment.
The content of the course: main topics and key ideas	Introduction to community ecology. Methods of classification and ordination of assemblages and communities. Cluster analysis: similarities and dissimilarities (Euclidean, Bray-Curtis, Jaccard, Kulczynski, Ruzicki, Manhattan, methods of grouping (UPGM, Ward). Gradient analysis: Indirect ordination (principal correspondence analysis PCA, principal coordinates analysis PCOA, non metric multidimensional scalling NMDS, (detrended) correspondence analysis DCA). Direct ordination (vectors fitting onto ordination, constrained correspondence analysis CCA, redundancy analysis RDA). The three table methods: RLQ, double CCA. Ordination with two species matrices: cocorrespondence analysis Co-Ca. Biodiversity: alpha and betadiversity. Species richness, Shannon-Wiener, Simpson, Pielou's evenness.
Didactic methods	Lectures, computer laboratories
Course requirements	Attendance of the course
Literature (basic and supplementary)	Borcard, D., Gillet, F., & Legendre, P. (2011). <i>Numerical ecology with R</i> . Springer. Wildi, O. (2013). <i>Data analysis in vegetation ecology</i> . John Wiley & Sons.
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> Students understand quantitative and statistical approach in study of communities. <i>Skills:</i> They are capable to adopt statistical tools in problem solution. <i>Social competences:</i> Students can work in a group and share their ideas.

The title of course	Data analysis and visualization in R (no. 45/I_22/ L/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc), Postgraduate (MA)
Semester	Winter/summer
The form of classes and number of hours	laboratories 15 hrs
Language of instruction	English
The number of ECTS	4
Teacher	Assoc. Prof. Damian Chmura
The aims of the course (maximum 500 characters)	Students become familiar with basic statistical methods and visualisation of data using R language and environment.
The content of the course: main topics and key ideas	Introduction to R: history, installation, help pages, forums. Data import, Structure of data in R: vectors, arrays, lists, data frames; Simple calculations, distribution f variables, random number generator; Data analysis: Tests for one sample, Tests for two samples (Student's tests, Mann-Whitney, Wilcoxon paired test), Tests for more samples (ANOVA, Kruskal-Wallis tests, post-hoc tests); Normality tests, tests of variance homogenization; Contingency tables; Correlation tests, regression; Multivariate analysis, cluster analysis, principal components analysis. Data visualization: Histogram, pie plots, barplots, box and whisker plots, scatter plots.
Didactic methods	Computer laboratories
Course requirements	Attendance, written reports based on performed analyses
Literature (basic and supplementary)	<i>Using R for Data Analysis and Graphics - An introduction</i> "J.H. Maindonald; <i>R for beginners</i> "E. Paradis; <i>„SimpleR - Using R for Introductory Statistics"</i> J. Verzani
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> Students understand basic tools in data analysis <i>Skills:</i> Student can apply statistical methods to solve problem with data using available software in R <i>Social competences:</i> Students work independently and in a group on the specific research task.

The title of course	Highway Engineering (lecture)
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	(no. 46/I_24/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc)
Semester	Winter
The form of classes and number of hours	Lecture 15 h
Language of instruction	English
The number of ECTS	1
Teacher	Anna Žak, Ph D
The aims of the course (maximum 500 characters)	The basic knowledge of road designing, construction and maintenance with elements of traffic engineering.
The content of the course: main topics and key ideas	Road categories and technical classes. Typical cross-sections for rural and urban roads. Design speed. Vehicles and road users. Horizontal and vertical alignment. Types of road drainage. Culverts. Soils. Earthwork. Road pavement. Intersections and interchanges. Traffic engineering. Streets. Pedestrians and sidewalks. Cyclist and bike path. Parking facilities. Mass transport in urban areas.
Didactic methods	Multimedia presentation
Course requirements	Geotechnics, Building materials, Hydrology
Literature (basic and supplementary)	- P. Right, R. Paquette: „Highway engineering“, 1987 John Wiley & Sons Inc. - R. Baker: „Handbook of highway engineering“. 1975 Van Nostrand Reinhold Comp.
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> - The basic knowledge of road geometry designing; - Ability to describe the road structures, drainage elements and technical equipment of roads. <i>Skills:</i> Selecting the technical solutions for roads and streets. <i>Social competences:</i> Is responsible for results of his own works and decisions.

The title of course	Highway Engineering (exercises) (no. 47/I_24/ L/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Undergraduate (BA), Engineer (BSc)
Semester	Winter
The form of classes and number of hours	Exercises 15 h
Language of instruction	English
The number of ECTS	1
Teacher	Anna Žak, PhD
The aims of the course (maximum 500 characters)	The basic knowledge of capacity
The content of the course: main topics and key ideas	Calculations of road capacity
Didactic methods	Classes with students
Course requirements	Traffic engineering
Literature (basic and supplementary)	P. Right, R. Paquette: „Highway engineering“, 1987 John Wiley & Sons Inc.
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> The basic knowledge of road capacity. <i>Skills:</i> Making the basic calculations of road capacity. <i>Social competences:</i> Is responsible for results of his own works and decisions.

The title of course	Foundations (Lectures) (no. 48/I_24/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Engineer (BSc), Undergraduate (BA),
Semester	Summer
The form of classes and number of hours	Lectures: 15 hours
Language of instruction	English
The number of ECTS	2
Teacher	Assoc. Prof. Jacek Pieczyrak/Assoc. Prof. Giang Nguyen
The aims of the course (maximum 500 characters)	The aim of the course is to acquire basic skills in the fields: developing the concept of foundation of structure, depending on structure and ground conditions, theoretical modeling and dimensioning of foundation structures.
The content of the course: main topics and key ideas	Foundations classification. Foundations design. Pad foundation (types, bearing capacity calculation, checking the stability of the foundation, settlement determination, dimensioning). Strip footings (types, methods of loads calculations, bearing capacity and settlement check, dimensioning). Combined footings. Raft foundation (slabs with basement walls). Dewatering of subsoil and excavation. Pile foundations (classification, pile types, bearing capacity and settlement check). Well foundations. Caissons.
Didactic methods	Multimedia presentations and illustrative material.
Course requirements	Final written exam
Literature (basic and supplementary)	Basic literature: 1) BRAJA M. DAS, 2011. <i>Principles of foundation engineering</i> . 8th edi. Boston: Cengage Learning. 946 p. ISBN-13: 978-1-305-08155-0. 2) Donald P. Coduto, 2001. <i>Foundation design. Principles and practices</i> . New Jersey: Prentice-Hall. Inc. 883 p. ISBN: 0-13-589706-8. Supplementary literature: Journals, Standards related to Geotechnical Engineering. Literature from Internet: e. g. http://www.geotechlinks.com/
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> - Student has knowledge on foundation classification, basics of foundation design and spread foundation execution;

	<ul style="list-style-type: none">- Student has knowledge on subsoil and foundation improvement as so as subsoil and excavation dewatering methods;- Student has knowledge on basics of design and execution of deep foundations. <p><i>Skills:</i></p> <ul style="list-style-type: none">- Student can choose proper type of spread foundation; check standard conditions of bearing capacity and settlement for basic types of spread foundations (pad footings, strip footings) and also design them;- Student can choose proper method of subsoil or excavation dewatering. <p><i>Social competences:</i></p> <ul style="list-style-type: none">- Student is aware of the responsibility for decisions related to the choice of the type of foundation and dewatering, as well as calculations performed in the field of geotechnics.
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The title of course	Soil Mechanics (Lectures) (no. 49/I_24/ L/S /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Engineer (BSc), Undergraduate (BA),
Semester	Winter
The form of classes and number of hours	Lectures: 15 hours
Language of instruction	English
The number of ECTS	2
Teacher	Assoc. Prof. Jacek Pieczyrak/Assoc. Prof. Giang Nguyen
The aims of the course (maximum 500 characters)	The aim of course is to familiarize students with soil, its origin, properties as so as physical laws soil subjects to. The result is that students obtain knowledge on this material, gain ability to design structures foundation correctly.
The content of the course: main topics and key ideas	Soil and its origin. Composition and structure of soil. Soil classification. Physical and mechanical properties of soil. Mohr-Coulomb failure criteria. Water in soil and phenomena associated with it. State of stress and strain in soil environment. Boussinesq problem. Spread load: a method of center points (Polszyn, Newmark), a method of corner points (Steinbrenner). Subsoil and stress in the subsoil at different stages of construction. Subsoil bearing capacity and deformability (subsoil load-deformation dependence). Uniform subsoil: critical and limit load. Layered subsoil (method of substitute foundation and Madej method). Subsoil deformation (stress method). Requirements for geotechnical documentation.
Didactic methods	Multimedia presentations and illustrative material; chalk and board.
Course requirements	Final written exam
Literature (basic and supplementary)	Basic literature: CRAIG, R. F. 1992. <i>Soil Mechanics</i> . 5th edi. London: Chapman & Hall. 427 p. ISBN 0-412-39590-8. Supplementary literature: Journals, Standards related to Geotechnical Engineering. Literature from Internet: e.g. http://www.geotechlinks.com/
The effects of education - Knowledge	<i>Knowledge:</i>

<ul style="list-style-type: none"> - Skills - Social competences 	<ul style="list-style-type: none"> - Student has knowledge on soil classification based on its particle size distribution and further properties; - Student has knowledge on evaluation of subsoil bearing capacity and deformation; - Student has knowledge on clarification of tasks related to soil. <p><i>Skills:</i></p> <ul style="list-style-type: none"> - Student can find information from literature and databases in English; <p><i>Social competences:</i></p> <ul style="list-style-type: none"> - Student can track the course of conducted classes; - Student has proactive approach in carrying out delegated tasks; - Student is aware of the responsibility for teamwork.
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The title of course	Soil Mechanics (Laboratory exercises) (no. 50/I_24/ L/E /W2)
Faculty	Faculty of Materials, Civil and Environmental Engineering
The level of studies	Engineer (BSc), Undergraduate (BA),
Semester	Winter
The form of classes and number of hours	Laboratory exercises: 15 hours
Language of instruction	English
The number of ECTS	2
Teacher	Assoc. Prof. Jacek Pieczyrak/Assoc. Prof. Giang Nguyen
The aims of the course (maximum 500 characters)	The aim of course is to familiarize students with soil and its properties. The result is that students obtain knowledge on this material.
The content of the course: main topics and key ideas	Structure and classification of soil. Macroscopic analysis. Sieve test and hydrometer test. Measurement of liquid limit and plastic limit. Measurement of maximum and minimum density. Oedometer test. Direct shear test and triaxial test. Proctor test.
Didactic methods	Practical exercises carried out by students.
Course requirements	Class attendance and test from carried out practical exercises.
Literature (basic and supplementary)	JOHN T. GERMAINE, AMY V. GERMAINE-CRAIG. 2009. <i>Geotechnical laboratory measurements for engineers</i> . 1st edi. Hoboken: John Wiley & Sons. 351 p. ISBN 978-0-470-15093-1. Supplementary literature: Journals, Standards related to Geotechnical Engineering. Literature from Internet: e.g. http://www.geotechlinks.com/
The effects of education - Knowledge - Skills - Social competences	<i>Knowledge:</i> - Student has knowledge on soil classification based on its particle size distribution and further properties; - Student has knowledge on clarification of tasks related to soil. <i>Skills:</i> - Student can carry out basic geotechnical tests of soil; - Student can found information from literature and databases in English; - Student can draw conclusions from tests results. <i>Social competences:</i>

	<ul style="list-style-type: none">- Student can track the course of conducted classes;- Student has proactive approach in carrying out delegated tasks;- Student is aware of the responsibility for teamwork.
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