Faculty of Civil and Environmental Engineering

WEST POMERANIAN UNIVERSITY OF TECHNOLOGY
IN SZCZECIN, POLAND

THE OFFER FOR INTERNATIONAL STUDENTS
FOR THE YEAR 2021/2022
FIRST DEGREE

	Course title	Person responsible for the course	Semester (winter/summer)	ECTS points	Hours
1	Advanced Concrete Structures	Piotr Brzozowski	summer	5	60
2	Air Pollution Control	Bogdan Ambrożek	winter/summer	4	60
3	Analysis of investment efficiency	Agnieszka Siewiera	winter/summer	5	60
4	Basic Concrete Structures	Piotr Brzozowski	winter	5	60
5	Basics of Design of Water Supply and Waste Conveyance Systems	Dorota Stocka	winter/summer	4	60
6	Basic Steel Structures	Małgorzata Abramowicz	winter/summer	6	75
7	Bridge Engineering	Janusz Hołowaty	winter/summer	5.0	60
8	Building Installations	Katarzyna Zwarycz-Makles	summer	3	30
9	Building Physics	Karolina Kurtz-Orecka	winter/summer	4	60
10	Computer drawing and detailing	Piotr Brzozowski	winter/summer	3	30
11	Construction Cost Estimating	Magdalena Bochenek	winter/summer	2	30
12	Contract Procedures	Krzysztof Tracz	winter	5.0	60
13	Design of Sustainable Buildings	Karolina Kurtz-Orecka	winter/summer	2	30
14	Design of Water Supply and Waste Conveyance Systems	Dorota Stocka	summer	5.0	60
15	Diploma seminar	Andrzej Pozlewicz	winter/summer	2	30
16	Elementary Structural Analysis	Hanna Weber	winter/summer	3.0	45
17	Energy Performance of Buildings	Karolina Kurtz-Orecka	winter/summer	4	45
18	Engineering Statistics	Bogdan Ambrożek	winter/summer	4	60
19	Environmental Geotechnology	Andrzej Pozlewicz	winter	3.0	30
20	Fluid Mechanics	Robert Mańko	winter/summer	4	45
21	Foundations design II - Deep foundations	Andrzej Pozlewicz	summer	5	60
22	Foundations design I - Shallow foundations	Andrzej Pozlewicz	winter	5	60
23	Fundamentals of Earth Science	Leszek Kaszubowski	winter/summer	3.0	30
24	Geoengineering	Andrzej Pozlewicz	winter/summer	3.0	30
25	Heat Sources	Dorota Leciej-Pirczewska	winter	5.0	60
26	Highway Engineering	Janusz Hołowaty	winter/summer	5	75
27	Hydrogeology	Leszek Kaszubowski	winter/summer	3.0	30
28	Hydrology	Robert Mańko	winter/summer	2	30
29	Industrial Steel Structures	Wiesław Paczkowski	summer	3.0	30

	Course title	Person responsible for the course	Semester (winter/summer)	ECTS points	Hours
30	Introduction to Eurocodes	Janusz Hołowaty	winter/summer	3	30
31	Negotiations and Conflict Management	Magdalena Bochenek	winter/summer	3	30
32	Numerical Methods in Engineering	Bogdan Ambrożek	winter/summer	4	60
33	Organization of a construction company	Agnieszka Siewiera	winter/summer	2	30
34	Project Management I	Krzysztof Tracz	winter	4	60
35	Project Management II	Krzysztof Tracz	summer	6	60
36	Quality Management Systems	Krzysztof Tracz	winter	5.0	60
37	Railway Engineering	Janusz Hołowaty	winter/summer	5.0	60
38	Roads, streets and junctions	Janusz Hołowaty	winter/summer	5	75
39	Site Management I	Krzysztof Tracz	winter	5.0	60
40	Site Management II	Krzysztof Tracz	summer	3.0	30
41	Soil Mechanics	Andrzej Pozlewicz	winter/summer	4	60
42	Strength of Materials	Hanna Weber	winter/summer	5.0	60
43	Sustainable Water Management	Dorota Stocka	winter/summer	3.0	30
44	Technology of Foundation Works	Andrzej Pozlewicz	winter/summer	3.0	30
45	Technology of Steel Structures	Małgorzata Abramowicz	summer	3	30
46	Theoretical Mechanics	Małgorzata Abramowicz	winter	4	45
47	Water Resources Engineering	Dorota Stocka	winter/summer	3	45

Course title	Advanced Concrete Structures		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Piotr Brzozowski	**E-mail address to the person**	Piotr.Brzozowski@zut.edu.pl
Course code (if applicable)	WBiIS-1-33-S	**ECTS points**	5
Semester	summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Advanced knowledge of concrete structural engineering		
Entry requirements	Strength of materials Basic Concrete Structures		
Course contents	Design and detailing of advanced reinforced concrete members. Standards and codes for advanced concrete structures. Environmental loads. Proprieties of prestressing steel. Basic of structural design of reinforced concrete elements (columns, stairs, walls, foundations). Basic of precast and prestressed concrete. Advanced analysis of bending, shear and compression.		
Assessment methods	lecture design workshop Continuous assessment Project works Written exam		
Recommended readings	1. Fundamentals of prestressed concrete design, PCI, 1991 2. Structural Elements Design Manual, Elsevier, 2009 3. Reinforced Concrete Design, Palgrave, 1999 4. Reinforced Concrete: Mechanics and Design, Pearson, 2009		
Knowledge	Student knows the rules for design of reinforced concrete members subjected to compression. Student knows the rules for constructing reinforced concrete foundations.		
Skills	Student can design complex reinforced concrete components of structures and building.		
Other social competences	The student understands the need for lifelong learning.		

Course title	Air Pollution Control		
Level of course	first cycle		
Teaching method	lecturing course / lecture		
Person responsible for the course	Bogdan Ambrożek	**E-mail address to the person**	Bogdan.Ambrozek@zut.edu.pl
Course code (if applicable)	WBiIS-1-39-WS	**ECTS points**	4
Semester	winter/summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	The student will be able to: 1. Identify the various types of air pollutants. 2. Explain the effects of pollutants on human beings and environment. 3. Describe the sources of air pollutants. 4. Demonstrate basic knowledge of control technologies preventing air pollution.		
Entry requirements	Fundamentals of chemistry and physics		
Course contents	Analysis of methods used for air pollution control: absorption, adsorption, biofiltration, catalytic destruction, particles capture. Introduction. Basic concepts. Air pollution. Smog in troposphere. Ozone depletion in stratosphere. Acid Rain. Aerosols: deposition and nucleation. Ambient Air Quality and Continuous Emissions Monitoring HAP and VOC Control: Absorption; Adsorption; Biofiltration; Thermal Oxidation; Catalytic Destruction; Condensation; Biofiltration; Membrane Separation. NOx Control. Control of SOx. Particles capture. Particulate Control: Cyclone Design; Design and Application of Wet Scrubbers; Filtration and Baghouses; Electrostatic Precipitators. Estimating cost of air-pollution control systems		
Assessment methods	Lecture illustrated by Power Point presentation and computer simulation Classes illustrated by computer and manual calculations Periodic assessment of student achievement Lecture: exam at the end of the semester Classes: written test		
Recommended readings	1. Gerald R. North, John A. Pyle, Fuqing Zhang, Encyclopedia of Atmospheric Sciences, V1-6, Academic Press, Burlington, 2014 2. Schnelle K.B., Brown C.A., Air pollution control technology handbook, CRC, Boca Raton, 2002 3. Flagan R.C.,, Fundamentals of air pollution engineering, Prentice-Hall, New Jersey, 1988 4. Vallero D.A., Fundamentals of air pollution, Academic Press, Burlington, 2008 5. Peirce J.J., Vesilind P.A., Weiner R.F., Environmental Pollution and Control, Elsevier, Amsterdam, 1997 6. Hill M.K., Understanding Environmental Pollution. A Primer, Cambridge University Press, Cambridge, 2004		
Knowledge	The student will be able to identify the various types of air pollutants.		
Skills	The student will be able to explain the effects of air pollutants on human beings and environment.		
Other social competences	The student will be able to demonstrate basic knowledge of control technologies preventing air pollution.		

Course title	Analysis of investment efficiency		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Agnieszka Siewiera	**E-mail address to the person**	Agnieszka.Siewiera@zut.edu.pl
Course code (if applicable)	WBiIS-1-37-WS	**ECTS points**	5
Semester	winter/summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Knowledge of techno-economic analysis of the viability of the project (project efficiency, financing options, method of profitability assessment as well as risk evaluation) Student has got the competence to the assess the feasibility of the project		
Entry requirements	the acquaintance of bases of the economy, credit for course: construction economics 1, Mathematics		
Course contents	Efficiency analysis of the selected project with the risk assessment Financing of construction projects. Public Private Partnership. Financing and project profitability. Costs of capital - capital budgeting. Investment decisions and criteria. Project selection in respect to the limited budget. Projects connected in portfolio - independent, complementary, exclusive. Assessment of project efficiency and business plans. Social costs and advantages. Economical and financial aspects of non-profit project profitability. K/K analysis. Project risk - types and methods of estimations, protective strategies and tools. Analysis of internal and external sources of financing. Loan costs and repayment - financial schedule. SWOT analysis, identification of the risk - matrix, project CASH FLOW. Efficiency analysis - static and dynamic methods, K/K analysis		
Assessment methods	lecture, discussion, case study, programming with Excel analysis of the selected project and written exam		
Recommended readings	1. D. Beal, Introducing Corporate Finance, John Wiley & Sons, New York, 2013 2. P. L. Bernstein, A. Damodaran, Investment Management, John Wiley & Sons, New York, 2011 3. A. Damodaran, Investment Valuation, John Wiley & Sons, New York, 2009 4. A. Keown, j. Martin, W. Petty, D. Scott, Financial Management. Principles and applications;, Pearson Education, New Jersey, 2012		
Knowledge	Knowledge of techno-economic analysis of the viability of the project		
Skills	Student has got the competence to the assess the feasibility of the project		
Other social competences	Is aware of professional behavior and compliance with the rules of professional ethics, is able to think and act in an entrepreneurial manner		

Course title	Basic Concrete Structures		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Piotr Brzozowski	**E-mail address to the person**	Piotr.Brzozowski@zut.edu.pl
Course code (if applicable)	WBiIS-1-32-W	**ECTS points**	5
Semester	winter	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Basic knowledge of concrete structural engineering		
Entry requirements	Strength of materials		
Course contents	Design and detailing of basic reinforced concrete members History of concrete structures Standards and codes for concrete structures Proprieties of concrete and reinforcement Structural fire design of concrete elements Basic of structural design of reinforced concrete (beams and slabs). Fundamentals of bending and shear.		
Assessment methods	Lectures Design workshop Continuous assessment Project works Written exam		
Recommended readings	1. Design of Structural Elements, Spon, 2009 2. Reinforced Concrete Design, Palgrave, 1999 3. Reinforced Concrete: Mechanics and Design, Pearson, 2009 4. Composite Structures of Steel and Concrete, Wiley, 2004		
Knowledge	Student knows and understands the theoretical foundations of reinforced concrete structures.		
Skills	Student is able to design simple elements of reiforced concrete construction.		
Other social competences	The student understands the need for lifelong learning.		

Course title	Basics of Design of Water Supply and Waste Conveyance Systems		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Dorota Stocka	**E-mail address to the person**	Dorota.Stocka@zut.edu.pl
Course code (if applicable)	WBiIS-1-01-WS	**ECTS points**	4
Semester	winter/summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	To understand the properties of water and wastewater flows To conceive and design simple water distribution system To conceive and design basic sewage system To conceive and design basic stormwater system		
Entry requirements	Basic hydrology and hydraulics Basic drafting skills - AutoCAD		
Course contents	Applying basic design principles to water supply and sewerage system design. Calculating the water demand and wastewater production. Calculating stormwater runoff. Sizing the basic utility systems. Preparing the basic design of water distributing system and wastewater and stormwater sewerage systems. Sustainable water management Drinking water properties and quality Water supply Water demand Water transmission - conditions, materials, etc Water distribution networks Midterm Waste waters Wastewater sewerage systems Stormwater systems		
Assessment methods	Project preparation with the use of computer applications (Excel, Word, AutoCAD) Obtaining project approval		
Recommended readings	1. AWWA, Sizing Water Service Lines and Meters, AWWA Manual M22, Denver, US, 2004, Second Edition 1. ASCE, Standard Guidelines for the Design of Urban Stormwater Systems, ASCE/EWRI 45-05, ASCE, Reston, Virginia, US, 2006 2. AWWA, PVC Pipe - Design and Installation Manual of Water Supply Practices M23, AWWA, Denver, US, 2002, Second Edition 3. I. Bizier, Paul, Gravity Sanitary Sewer, Design and Construction, ASCE, Reston, Virginia, US, 2007, Second Edition		
Skills	Upon successful completion of this course, the student will be able to: - design simple sanitary sewer and water distribution system in accordance with the local municipal design criteria prepare basic water and sewer plan and profile dwg		

Course title	Basic Steel Structures		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Małgorzata Abramowicz	**E-mail address to the person**	Malgorzata.Abramowicz@zut.edu.pl
Course code (if applicable)	WBiIS-1-02-WS	**ECTS points**	6
Semester	winter/summer	**Language of instruction**	english
Hours per week	5	**Hours per semester**	75
Objectives of the course	To introduce to students the theory and application of analysis and design of steel structures To develop students with an understanding of the behavior and design of steel members and systems To prepare students for the effective use of the latest industry standard formulas, tables, design aids and computer software in the design of steel members		
Entry requirements	Mathematics Load estimation skills Structural analysis capability Shear and moment diagrams obtained from static analysis under the appropriate loads Technical drawing		
Course contents	Design elements of a steel industrial storage building comprising secondary beams, girders, column axially compressed and connections. Introduce the behaviour and design of steel structural members according to the limit states design concept. The behaviour and design of tension members, compression members, laterally restrained and unrestrained beams, beam-columns and design of connections. Elements axially extended Elements of axial compression The complex states of load of steel Bolted connections Welded joints		
Assessment methods	Information lecture Issue lecture Audio-visual presentation Mark for the design Written exam		
Recommended readings	1. Lam, D., Ang, T-C. and Chiew, S-P, Structural Steelwork: Design to Limit State Theory, Butterworth-Heinemann Ltd. 2. Morris, L. J. & Plum, D. R., Structural Steelwork Design to BS 5950, Prentice Hall, 2nd Edition 3. Gardner, L. and Nethercot, D. A., Designer’s guide to Eurocode 3: Design of steel structures, Thomas Telford Limited, 2005 4. Eurocode 1: Actions on structures 5. Eurocode 3: Design of steel structures		
Knowledge	The student is able to design a simple structures and elements of civil engineering. The student has basic knowledge in civil engineering.		
Skills	Student knows codes and guidelines of designing civil engineering structures and elements. Student knows the rules used in the manufacture of steel structures elements. Student can set up the loading acting on the structure. Student can dimension and design of selected elements and simple steel structures.		
Other social competences	The student will be aware of the responsibility for the reliability of the results obtained		

Course title	Bridge Engineering		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Janusz Hołowaty	**E-mail address to the person**	Janusz.Holowaty@zut.edu.pl
Course code (if applicable)	WBiA-1-03-WS	**ECTS points**	5.0
Semester	winter/summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Understanding bridge structure and their elements. Knowledge of basic rules for desiging of bridge structures. Preparing a simple bridge technical or technological design.		
Entry requirements	Technical drawings, CAD preferable. Elementary structural analysis.		
Course contents	Characteristics of bridge and transportation engineering. Basic terms for bridges. Project work range explenation. Determination of bridge cross section. Bridge surfacing. Safety barriers and other safety elements. Connection of a road and a bridge. Shaping of bridge span. Rules for bridge general drawing. Work verification and drawings correction. Basic rules for bridge structural analysis. Types of actions on bridges. Models for live loads. Rules for action combinations for selected bridge memebers. Examples of a load determination. Scope of structual analysis. Rules for internal forces calculation and envelop determination. Rules for infuence line usage. Infuence lines for bending moments and shear forces. Determination of internal forces envelopes (M i V). Structural analysis checking and corrections. Possibility of simplified structural analysis. Rules for dimentioning of reinforced concrete elements in bridge structures. Main and additional reinforcement. Rules for durability of structures and design life. Selection of minimal class of structural concrete. Design of a singly reinforced rectangular section. Design of concrete elements for shear. Qualificfation of section for shear. Calculation of reguired and minimal shear reinforcement. Initial selection of link arrangment in concrete elements. elemencie. Structural requirements for reinforcement. Detailing of reinforcement. Shrinkage and additional reinforcement. Requirements for reinfocement in slab spans. Checking of reinforcment calculation and arrangment. Basic rules for preparing of reinforcement drawing. List of materials. Explanation and corrections to reinforcement drawings. Checking of knowledge and comppetence in project work. Final corrections of structural drawings and project works. Discussion on rabge of knowledge and competence for checking. Examples of concrete bridge construction technologies. Resume of project work and final notes. Course range and basic topics. Recommended literature. Bridge menagment in Poland and over the world. Bridge structures in transportation systems. Types of engineering and bridge structures. Tunnels and subways. Ecological structures in transportation infrastructure. Basic dimentions of bridge structures. Openings and clearances for structures. Structural elements of bridge structures. Bridge accessories. Determination of a road bridge cross section (road & bridge). Selection of bridge structural elements and accessories. Materials in bridge construction. Test No. 1. Summary. Action on bridges - permament, variable and live actions. Live loads on road bridges, railway bridges and pedastrian bridges. Basic rules for action combination, combination schemes. Partial factors for actions. Examples of action combinations for simple structural bridge members. Basics of structural analysis. Rules for determination of internal forces. Calculation example for a one-span bridge. Rules developed for simplified calculations. Dimentionig of conrete and steel sections. Basic rules and examples of section werifications. Basic type of concrete bridges. Basic types of steel bridges. Structural concrete, reinforcement and prestresssing steel in bridges. Basic design parameters of concrete and reinforcement. Test No. 2. Structural system of bridges.		

	Summary. Bridge accessories. Types of bridge bearings. History of bridge construction. Notes and credits for a course.
Assessment methods	Informing lecture Problem lecture Project method Lecture credit. Lecture and project tests Project work execution
Recommended readings	1. Barker R.M., Puckett J.A., Design of Highway Bridges, Wiley, Hoboken, New Jersey, 2007, 2 2. Tonias D.E., Zhao J.J., Bridge Engineering, McGrawHill, New York - Toronto, 2007, 2 3. Troitsky M.S., Planning and Design of Bridges, Wiley, New York - Singapore, 1994
Knowledge	Basic knowledge of bridge engineering and materials used in bridge construction Know the basic standards and structural rules for static analysis.
Skills	Can use basic standards and technical rules apllied to bridges.
Other social competences	Basis for constant learning and care for the high level of executed works.

Course title	Building Installations		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Katarzyna Zwarycz-Makles	**E-mail address to the person**	Katarzyna.Zwarycz-Makles@zut.edu.pl
Course code (if applicable)	WBiIS-1-04-S	**ECTS points**	3
Semester	summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Understanding of the workings of building installation (water supply, sanitary, gas, central heating, domestic water system – cold and tap water), performing of calculations and selection of typical basic installation equipment (pipes dimension, water meter, gas meter, boiler, radiators), making design drawings of water installations		
Entry requirements	Ability to draw in AutoCad		
Course contents	Calculate the water and sewerage installations for single-family house. Calculate the central heating and gas installation for single-family house. Determination of pipe diameters and water / wastewater systems. Calculation of heat transfer coefficient values. Identify the need for central heating, the selection of radiators and heat sources. Implementation of drafting projections and sketches (expansions, isometric). Installation materials: pipes, fittings, connections. Pump characteristics, co-operation with the installation. Water and sanitary installations, the principles of design installation. Thermal comfort of rooms. Heating systems: boilers, radiators, thermostatic valves, heat exchangers and expansion vessels. Heat source: boiler and heat distribution centers, construction requirements. Security sources of heat. Centralized supply of heat. Insulation of heat and cold.		
Assessment methods	Lecture, ppt presentation, workshop, practical design lecture: oral exam		
Recommended readings	1. Panchdhari Ac, Water supply and sanitary installations with building design construction and maintenance, New Age International, 2008 2. Ulrich Fox, Installation techniques in housing, Arkady, 1998 3. Standards:, Installations in buildings, http://www.standardsuk.com, 2011 4. Producer/manufacturer catalogues and instructions of equipment		
Knowledge	Cognition of the rules of design and working of water systems in the housing. Formulate, and solve thermal, fluid engineering problems.		
Skills	Design the fundamental elements of domestic water/sewerage system. Design the fundamental elements of central heating system. Design the main elements of heat source for central heating/tap water system in the single-family housing, Employ computing techniques in comprehensive manner to support the study and solution of water installation design problems. Produce engineering drawings of designed water installations.		
Other social competences	Communicate effectively with written, oral, and visual means in a technical setting. Discuss of contemporary environmental issues. Make effective use of source materials, including literature searches, references.		

Course title	Building Physics		
Level of course	first cycle		
Teaching method	laboratory course / project course / lecture		
Person responsible for the course	Karolina Kurtz-Orecka	**E-mail address to the person**	Karolina.Kurtz@zut.edu.pl
Course code (if applicable)	WBiIS-1-05-WS	**ECTS points**	4
Semester	winter/summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Skills to computation of building partitions heat transfer coefficient Skills to computation of linear heat transfer coefficient of thermal bridges Skills to evaluate thermal bridges influence on the energy performance of buildings Skills to evaluate thermal characteristics of building materials and partitions using basic laboratory equipment		
Entry requirements	Knowledge of the fundamentals of the Building Materials Knowledge of the fundamentals of Civil Engineering		
Course contents	Evaluation of building materials and partitions thermal characteristics using basic laboratory equipment Heat transfer coefficient of building partitions with homogenious and inhomogenious layers Thermal and moisture control Computaion of influance of thermal bridges Thermal environment Thermal behavior of buildings Fundamentals of heat transfer through building partitions Thermal and moisture control Building envelope weak points - evaluation of thermal bridges		
Assessment methods	Lecture Project work Demonstration Laboratory work Current evaluation of laboratory work Current evaluation of project work Evaluation test		
Recommended readings	1. Incopera F.P., DeWitt D.P., Bergman T.L., Lavine A.S., Fundamentals of Heat and Mass Transfer - Sixth Edition, John Wiley & Sons, 2007 2. McMullan R., Environmental Science in Building - Fifth edition, Palgrave MacMillan, New York, 2006 3. Smith P.F., Architecture in a Climate of Change - A guide to sustainable design - Second edition, Elsevier Architectural Press, Amsterdam – Boston – Heidelberg – London – New York – Oxford – Paris – San Diego – San Francisco – Singapore – Sydney – Tokyo, 2005 4. EN ISO, EN, ISO Standards		
Knowledge	Basic knowledge of physical behavior of building partitions (heat and mass transfer)		
Skills	Student is able to: compute building partitions of heat transfer coefficient, linear heat transfer coefficient, evaluate thermal bridges influence on the energy performance of buildings, to evaluate thermal characteristics of building materials using basic laboratory equipment		
Other social competences	Student understands importance of proper hydrothermal behavior of building partitions		

Course title	Computer drawing and detailing		
Level of course	first cycle		
Teaching method	laboratory course		
Person responsible for the course	Piotr Brzozowski	**E-mail address to the person**	Piotr.Brzozowski@zut.edu.pl
Course code (if applicable)	WBiIS-1-41-WS	**ECTS points**	3
Semester	winter/summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Basic knowledge of drawing in CAD environment Structural detailing with use of civil engineering dedicated computer programs		
Entry requirements	Hand drawing		
Course contents	Introduction to basic concepts of numerical methods and preparation of engineering drawings Preparation of technical drawings in AutoCAD Modeling and performing of numerical calculations using computer programs		
Assessment methods	laboratory Continuous assessment Project works		
Recommended readings	1. Programs manuals and tutorials, 2016 2. Design Theory and Methods using CAD/CAE, Elsevier, 2014		
Knowledge	Student: has a basic knowledge of the preparation of technical drawings using AutoCAD. Student has a basic knowledge of use the civil engineering calculation software.		
Skills	Student is able solve simple engineering problems using computer programs.		
Other social competences	The student understands the need for lifelong learning.		

Course title	Construction Cost Estimating		
Level of course	first cycle		
Teaching method	lecturing course / lecture		
Person responsible for the course	Magdalena Bochenek	**E-mail address to the person**	Magdalena.Bochenek@zut.edu.pl
Course code (if applicable)	WBiIS-1-43-WS	**ECTS points**	2
Semester	winter/summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Upon completion of this course the student will be able to comprehend techniques of estimating covered include quantity take-off, labour productivity, and cost of labour, material, and equipment		
Entry requirements	Basic knowledge of construction technology and construction materials		
Course contents	Read and interpret the drawings and specifications Perform quantity takeoffs based on the drawings and specifications and generate detailed estimates Prepare quantity take off of excavation and back-fill Prepare a quantity take off of concrete, and formwork Prepare quantity take off of masonry and finishes Direct and indirect construction costs Use computer to assist in quantity takeoffs Introduction to construction cost estimating The role of estimating in the construction Different types of estimates and their uses Cost estimating techniques Direct and indirect construction costs Labour productivity and labour hours Quantity take-off for materials, labour and equipment cost		
Assessment methods	lecture exercises case study written exam		
Recommended readings	1. Pratt D., Fundamentals of Construction estimating, Delmar Cengage, 2011		
Knowledge	Student has the basic knowledge about techniques of estimating, quantity take-off, labour productivity, and cost of labour, material, and equipment.		
Skills	The student should calculate the cost of construction works.		
Other social competences	The student proceed according to the rules of ethics.		

Course title	Contract Procedures		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Krzysztof Tracz	**E-mail address to the person**	Krzysztof.Tracz@zut.edu.pl
Course code (if applicable)	WBiIS-1-06-W	**ECTS points**	5.0
Semester	winter	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Upon completion of this course the student will be able to comprehend techniques of contract procedures		
Entry requirements	Basic knowledge of construction technology and construction materials		
Course contents	Bidding strategy procurement for defined type of private construction contract, Development of Employer`s and Contractor`s risk matrix for defined type of construction contract, Identification of contractor`s scope of duties for defined type of contract, Definition of supervision principles for identified type of contract, Definition of iterim test of works for identified type of contract, Principles of passing tests on works complition for defined type of contract, Development of Contract sample for defined type of contract, Credit of elaboration, Fundamental principles and definitions of construction contract, Bidding specificity in construction depending on private/ public sector, Different types of contract used by private employers, Strategy and optimization of Employer`s risk for different types of construction contracts - examples, Lumpsum contract - metodology of evaluations, Fixed unit price contract- metodology of evaluations, Reimbursable contracts - assessement of works value, Pre-selection contract - the principles of bidder`s assessement, Negociations in private contract procedures, Turn-key contracts - the principles of procurement, Construction contracts with mixed value assessement, Definition of bid- and performance bonds, Definition of different types and conditions of contractor`s insurances, General condition of contract for project management,		
Assessment methods	lecture Continuous project assessment written exam		
Recommended readings	1. John Murdoch, Will Hughes, Construction Contracts Law aud management, Taylor& Francis, London, 2010 2. Seeley Ivor H., Quantity Surveying Practice, MacMillan, London, UK, 1996		
Knowledge	Rozróżnia podstawowe rodzaje kontraktów i sposoby ich rozliczania, identyfikuje podstawowe ryzyka		
Skills	Opracować ofertę przetargową na roboty budowlane,potrafi kalkulować cenę ofertową przedmiotu zamówienia.		
Other social competences	Jest odpowiedzialny za pracę własną oraz całego zespołu, jest świadomy zadań określonych w przygotowaniu dokumentacji przetargowej.		

Course title	Design of Sustainable Buildings		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Karolina Kurtz-Orecka	**E-mail address to the person**	Karolina.Kurtz@zut.edu.pl
Course code (if applicable)	WBiIS-1-07-WS	**ECTS points**	2
Semester	winter/summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Knowledge of main goals of the sustainable development Knowledge of design challenges for a changing climate Skills of finding proper solutions for construction, materials and thermal insulation for buildings situated in different climates Basic knowledge of passive buildings design		
Entry requirements	Knowledge of the fundamentals of the Building materials Knowledge of the fundamentals of the Civil Engineering Knowledge of the fundamentals of the Building installations (optional)		
Course contents	Elements of sustainable building design Building evaluation tests - thermal behavior and air tightness Sustainable development - Science of sustainability Challenges for the building environment Legislation and Regulations in Europe Sustainability – Tools and techniques Design for sustainability – design for a changing climate Design of sustainable buildings Low energy and passive buildings		
Assessment methods	Lecture / Case method Essays Project work Demonstration Project work evaluation Continous assessment Essays evaluation Evaluation test		
Recommended readings	1. Edwards B., Rough Guide to Sustainability - 3rd Edition, RIBA Pablishing, London, 2010 2. Guzowski M., Towards Zero-energy Architecture - New Solar Design, Laurence King Publishing, London, 2010 3. Hegger M., Fuchs M., Stark T., Zeumer M., Energy Manual - Sustainable Architecture - Edition Detail, Birkhäuser, Basel - Boston - Berlin, 2008 4. Jonstone D., Gibson S., Toward a Zero Energy Home - A complete Guide to Energy Self-Sufficiency at Home, The Taunton Press, Newtown, 2010 5. Roaf S., Fuentes M, Thomas S., Ecohouse - A Design Guide, Elsevier Architectural Press, Amsterdam – Boston – Heidelberg – London – New York – Oxford – Paris – San Diego – San Francisco – Singapore – Sydney – Tokyo, 2007 6. Smith P.F., Architecture in a Climate of Change - A guide to sustainable design, Elsevier Architectural Press, Amsterdam – Boston – Heidelberg – London – New York – Oxford – Paris – San Diego – San Francisco – Singapore – Sydney – Tokyo, 2005		
Knowledge	Student has basic knowledge of design challenges for a changing climate Student knows the basic pronciples of design of passive buildings		
Skills	Student can find proper solutions for construction, materials and thermal insulation for building situated in different climate.		
Other social competences	Student understands the need to design buildings in accordance with the idea of sustainable development		

Course title	Design of Water Supply and Waste Conveyance Systems		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Dorota Stocka	**E-mail address to the person**	Dorota.Stocka@zut.edu.pl
Course code (if applicable)	WBiIS-1-08-S	**ECTS points**	5.0
Semester	summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Municipal services - Understanding the principles and design standards Understanding the principles of water distribution, storm and sanitary sewerage systems. Understanding the approval, planning and design processes. Understanding the basic design criteria and hydraulic analysis for sanitary sewers, stormwater and water distribution systems. Preparing a detailed conceptual site servicing plan for a small residential development.		
Entry requirements	Hydrology Hydraulics Technical drawing and AutoCAD		
Course contents	Applying basic design principles to water supply and sewerage systems design. Calculating the water demand and wastewater production. Calculating stormwater runoff. Sizing the basic utility systems. Municipal servicing - requirements for utility alignment, materials and specifications Preparing the detailed designs of water distributing system and sanitary and storm sewerage systems for a residential subdevision layout. Municipal infrastructure - general design and analysis consideration. Overview of municipal servicing standards and design criteria. General requirements for sustainable land development and water management Water demand and supply Water transmission - conditions, elements, materials, fittings, etc Water distribution network design Midterm test Waste waters and severage systems Sewer transmission - conditions, network elements, materials, etc Stormwater systems		
Assessment methods	Lecture Presentations and video movies Project preparation with the use of computer Obtaining grade for project work		
Recommended readings	1. AWWA, Sizing Water Service Lines and Meters, AWWA Manual M22, Denver, US, 2004, Second Edition 2. AWWA, PVC Pipe - Design and Installation Manual of Water Supply Practices M23, AWWA, Denver, US, 2002, Second Edition 3. I. Bizier, Paul, Gravity Sanitary Sewer, Design and Construction, ASCE, Reston, Virginia, US, 2007, Second Edition		
Skills	Upon successful completion of this course, the student will be able to: - design simple storm, sanitary sewer and water distribution system in accordance with the local municipal design criteria - prepare water and sewer plan and profile dwg - describe material and construction specs for W and SS		

Course title	Diploma seminar		
Level of course	first cycle		
Teaching method	diploma/thesis seminars		
Person responsible for the course	Andrzej Pozlewicz	**E-mail address to the person**	Andrzej.Pozlewicz@zut.edu.pl
Course code (if applicable)	WBiIS-1-50-WS	**ECTS points**	2
Semester	winter/summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	to manage to connect various knowledge from various disciplines within one project based task		
Entry requirements	Knowledge and skills of fundamental disciplines gained during studies		
Course contents	Preparation of realization plan and scope of diploma thesis with taking into consideration requirements of sending university Determination of aim and structure of the thesis, approval of research project, foredesign preparation. Intelectual property law (copyright) Taking advantage of source information, methods of literature searching, using e-books platforms with respect to licence agreements. Uising specialistic shareware and licenced software. Presentation of thesis advancing, presentations skills, preliminary linguistic thesis correction, editing, drawings layout, tables content, bibliographical data Discussion on crucial elements of diploma thesis, data analysis, discussion on results of static calculations, proposals of technical solutions, selection of optimum variants Drawing conclusions, design guidelines, summary of calculation part (research), drawings correction, preparation to oral thesis defence. Rules of thesis presentation and defense with respect of sending university.		
Assessment methods	projects method Problem based lecture Practical methods (presentation) Seminar Presentation of assumptions and working plan of the thesis and expected results Presentation of research project results (calculations, drawings) Conclusions drawn out of case studies, estimation so far received results Final mark on the basis of quality of discussion activity and results psesentation		
Recommended readings	1. Gaugh, H. G.,, Scientific Method in Practice, Cambridge University Press, Cambridge, 2003 2. Douglas C. Montgomery, Design and Analysis of Experiments, John Wiley & Sons, Inc., 2013, 8th Edition 4. Literature according to a scope of final thesis suggested by the tutor, 2019		
Knowledge	Student knows typical technologies used in structural and material solutions in civil engineering and knows basic trends in building iondustry		
Skills	Student is able to use basic engineering solutions in constructions by means of a computer software, data processing and other sources		
Other social competences	Student is able to extend the professional knowledge, knows basic rules in team work and is able to communicate with a society to present his work		

Course title	Elementary Structural Analysis		
Level of course	first cycle		
Teaching method	lecturing course / lecture		
Person responsible for the course	Hanna Weber	**E-mail address to the person**	Hanna.Weber@zut.edu.pl
Course code (if applicable)	WBiIS-1-09-WS	**ECTS points**	3.0
Semester	winter/summer	**Language of instruction**	english
Hours per week	3	**Hours per semester**	45
Objectives of the course	To learn the basics of structural analysis: design loads, types of elements and supports, internal forces – drawing the diagrams, cross-section properties, types of stress and methods of structural computations.		
Entry requirements	Mathematics		
Course contents	Design loads Stability of the structural system. Statics of structures - reactions. Internal forces – drawing the diagrams for planar trusses, beams and frames. Cross-section properties. Axial and bending stresses Test Aims of structural engineering. Theory of structures. Structural elements and their behaviour: beams, frames, trusses and arches. Design loads. Types of supports - reactions. Statics of structures. Stability of the system. Internal forces – drawing the diagrams for planar trusses, beams and frames. Cross-section properties Static indeterminacy. Axial and bending stresses.		
Assessment methods	Information lecture Issue lecture Audio-visual presentation Computational exercises Continuous assessment in practical classes Final test		
Recommended readings	1. K.M. Leet, Ch.-M. Uang, A.M. Gilbert, Fundamentals of Structural Analysis, McGraw-Hill, 2011, fourth edition 2. W. M.C McKenzie, Examples in structural analysis, Taylor and Francis, 2007 3. P. Garrison, Basic Structures for Engineers and Architects, Blackwell, 2008 4. M.A. Sozen, T. Ichinose, Understanding Structures. An introduction to Structural Analysis., CRC, 2009 5. R.S. Narayanan, A.W. Beeby, Introduction to Design for Civil Engineers, Spon., 2001		
Knowledge	Student knows the design loads, types of elements and supports, internal forces, types of stress.		
Skills	Student is able to draw the diagrams of internal forces for planar trusses, beams and frames. Student is able to calculate the cross-section properties.		
Other social competences	The student is aware of the responsibility for his own calculations		

Course title	Energy Performance of Buildings		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Karolina Kurtz-Orecka	**E-mail address to the person**	Karolina.Kurtz@zut.edu.pl
Course code (if applicable)	WBiIS-1-46-WS	**ECTS points**	4
Semester	winter/summer	**Language of instruction**	english
Hours per week	3	**Hours per semester**	45
Objectives of the course	Skills of choosing energy balance calculation methods for different study buildings Skills of preparing project data (building, systems, use, surroundings, location) Understanding of building energy performance results Skills of building energy performance calculation of buildings with simple technical systems		
Entry requirements	Knowledge of the fundamentals of Building Materials Knowledge of the fundamentals of Civil Engineering Knowledge of the fundamentals of Building Physics		
Course contents	Calculation of energy use for space heating for a building with simple energy systems Energy demands of the building - Building energy balance for heating mode - Energy performance of buildings - Final energy - Primary energy Building energy standards - Energy demnads of the building - Specyfic project data Building heat transfer - Heat transfer by transmission: one dimensional heat flow, thermal bridges - Heat transfer by ventilation - design air volume rates, infiltration rates Building heat gains: internal gains, solar gains - Sun-Earth relationship (Sun path diagrams) - Radiation control Building energy need space for heating and cooling Calculation of energy use for space heating and coolong - Calculation methods - Quasi-steady-state method - Dynamic methods - Simulation modeling		
Assessment methods	Lectures Case method Project method Essays evaluation Test or current rating during classes Final test		
Recommended readings	1. Hegger M., Fuchs M., Stark T., Zeumer M., Energy Manual - Sustainable Architecture - Edition Detail, Birkhäuser, Basel - Boston - Berlin, 2008 2. Jonstone D., Gibson S., Toward a Zero Energy Home - A complete Guide to Energy Self-Sufficiency at Home, The Taunton Press, Newtown, 2010 3. International Standards		
Knowledge	Understanding of building energy performance results		
Skills	Skills of choosing energy balance calculation methods for different study building. Student is able to prepare project data, understands building energy performance results, can calculate building energy performance with simple technical systems		
Other social competences	Understanding of importance of building energy performance in modern project design		

Course title	Engineering Statistics		
Level of course	first cycle		
Teaching method	lecturing course / lecture		
Person responsible for the course	Bogdan Ambrożek	**E-mail address to the person**	Bogdan.Ambrozek@zut.edu.pl
Course code (if applicable)	WBiIS-1-28-WS	**ECTS points**	4
Semester	winter/summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	The student will be able to: 1. Use of statistical techniques in engineering. 2. Understand how the statistical algorithms work.		
Entry requirements	Mathematics		
Course contents	Discrete Random Variables. Probability Distributions. Random Sampling and Data Description. Statistical Intervals. Tests of Hypotheses. Simple Linear Regression and Correlation. Multiple Linear Regression. Nonlinear regression. Nonparametric statistics. Design of Experiments. Statistical quality control. The Role of Statistics in Engineering. Discrete Random Variables. Probability Distributions. Random Sampling and Data Description. Statistical Intervals. Tests of Hypotheses. Simple Linear Regression and Correlation. Multiple Linear Regression. Nonlinear regression. Nonparametric statistics. Design of Experiments. Statistical Quality control.		
Assessment methods	Lecture illustrated by Power Point presentation and computer calculations. Classes illustrated by computer calculations. Periodic assessment of student achievement Lecture: exam at the end of the semester Classes: written test		
Recommended readings	1. Montgomery D.C., Runger G.C., Hubele N.F., Engineering Statistics, Wiley, New York, 2010 2. Montgomery D.C., Runger G.C., Applied Statistics & Probability for Engineers, Wiley, New York, 2002 3. Triola M.F., Essentials of Statistics, Pearson, Boston, 2015 4. Hogg R.V., McKean J.W., Craig A.T., Introduction to Mathematical Statistics, Pearson, Boston, 2015		
Knowledge	The student will be able to understand how the statistical algorithms work		
Skills	The student will be able to use statistical techniques in engineering.		
Other social competences	The student will be able to use of statistical techniques in engineering.		

Course title	Environmental Geotechnology		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Andrzej Pozlewicz	**E-mail address to the person**	Andrzej.Pozlewicz@zut.edu.pl
Course code (if applicable)	WBiIS-1-10-W	**ECTS points**	3.0
Semester	winter	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Understanding rules of interaction between antropogenic materials and soil with the effect of underground water presence Skills in recognition of risks for soil and aquatic environment from civil engineering activity To prepare to work in a team in assgnements and develop skills in presentation and discussion on project results in English		
Entry requirements	Completed course of engineering geology Completed course of soil mechanics Completed course of foundation engineering English language at B2 level		
Course contents	Basic design of a landfill for given geological data with respect to soil - waste interaction. Presentation of team work project on specified item. Geotechnics and the environment, environmental basics. Soil investigation for environmental purposes, sampling. Landfill siting and site investigation. Seepage and groundwater control, grouting. Waste disposal by landfill, clay liners. Geomembranes and composite liners. Contaminated land, brown fields. Waste materials in geotechnical construction. Soil - waste interactions. Groundwater lowering in construction. Effects of groundwater movement on environment. Landsubsidence caused by human activities and natural causes. Slurry walls, cut-off walls, technology, design and construction. Key issues of environmental geotechnology impact on built environment		
Assessment methods	lecture problem oriented lecture method of projects Continuous assessment of team work on the project Project defence, group discussion Oral completion of lectures content		
Recommended readings	1. Hsai-Yang Fang, Ronald C. Chaney, Introduction to Environmental Geotechnology, CRC Press, 2016, 2nd Edition 2. Fang H.-Y., Daniels J. L., Introductory Geotechnical Engineering. An Environmental Perspective, Taylor @ Francis, London, New York, 2006, 1, VIII-122 3. Sarsby R., Environmental Geotechnics, Second Ed., ICE Publishing, London, 2013, II 4. Keller E. A., Environmental Geology, Prentice Hall, New York, 2000, 8 5. Qian X., Koerner R. M., Gray D. H., Geotechnical Aspects of Landfill Design and Construction, Prentice Hall, Upper Saddle River, 2002, 1, VIII-860 6. Sharma H. D., Lewis S. P., Waste Containment Systems, Waste Stabilization, and Landfills: Design and Evaluation, John Wiley @ Sons, New York, Chichester, 1994, 1		
Knowledge	Knows basic codes of practice for technologies used in subsoil improvement in civil engineering Knows basic materials used in geotechnology Knows typical engineering techologies implemented in environmental geotechnology Must have knowledge on impact of given soil improvement technology on environment		
Skills	Student is able to : identify basic threats of geotechnical engineering for the environment, design technical part of a municipal landfill, understand the underground water pollution mechanism, propose technological solutions of soil and water remediation Is able to design elements of waste disposal liners Is able to make use of electronic libraries in range of information searching linked to environmental geotechnology		

	Is skilled with English language communication at B2 level with vocabulary of technical English connected to environmental geotechnology
Other social competences	Understands the impact and results of geotechnical engineering on environment Understands the effects of chosen geotechnical technologies on personal and team safety. Understands a need to transfer the knowledge in environmental geotechnology to the society

Course title	Fluid Mechanics		
Level of course	first cycle		
Teaching method	laboratory course / seminars / lecture		
Person responsible for the course	Robert Mańko	**E-mail address to the person**	Robert.Manko@zut.edu.pl
Course code (if applicable)	WBiIS-1-30-WS	**ECTS points**	4
Semester	winter/summer	**Language of instruction**	english
Hours per week	3	**Hours per semester**	45
Objectives of the course	Understands the principles of static and dynamic Able to solve problems of statics, fluid movement: in pipes under pressure, in open channels and in soil Understands basic hydrological concepts		
Entry requirements	Knowledge of the basics of hydrology and geography		
Course contents	Laboratory introduction Determining the limit number of Reynolds Determination of energy and pressure losses in pipes under pressure Determination of the permeability coefficient Water and sediment transport in open channels Final reports testing Physical properties of liquid Hydrostatic pressure Fluid pressure on flat and any surfaces Uplift. Principle of swimming bodies Flow under pressure Flow in open channels Filtration Physical characteristics of the liquid, hydrostatic pressure Hydrostatic pressure on flat surfaces Hydrostatic pressure on any surfaces General definitions in hydrodynamics. types of flows Reynolds number, hydraulic radius Bernoulli equation Local and length friction losses Water flow and sediment transport in open channels Chezy formula, application Filtration		
Assessment methods	Information lecture Solving tasks from the entire range of hydraulics lectures Introduction, help and explanation of current problems arising during laboratory exercises Knowledge test Completing two tests Checking knowledge about the performed laboratory exercises		
Recommended readings	1. Chow, Ven Te, Open channel hydraulics, McGraw-Hill Book, New York, NY. 680., 1959 2. Chow, Ven Te, Handbook of applied hydrology, McGraw-Hill Book Co., New York, NY., 1964		
Knowledge	Basic knowledge of fluid mechanics		
Skills	Student is able to design/calculate simple water system		
Other social competences	The student understands the need for lifelong learning.		

Course title	Foundations design II - Deep foundations		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Andrzej Pozlewicz	**E-mail address to the person**	Andrzej.Pozlewicz@zut.edu.pl
Course code (if applicable)	WBiIS-1-49-S	**ECTS points**	5
Semester	summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	To provide knowledge of available technologies used in foundation engineering of structures Formation of presentation skills used in project presentation in the English language To create an ability to understand personal responsibility for team work and results		
Entry requirements	Completed course of engineering geology Completed course of strength of materials Completed course of theoretical mechanics Completed course on basics of foundation engineering English language skills at B2 level		
Course contents	Basic design of axially loaded piles under given loads and construction Selection of foundation type and technology, geotechnical conditions, geotechnical categories Slurry walls, caissons, deep shaft foundations. Pile technology with various geotechnical conditions. Basics of axially loaded pile design. Static and dynamic test loading. Pile types, displacement and nondisplacement piles, actions and design situations, design by calculations (ultimate limit states) according to Eurocode 7 Pile design in cohesive and non-cohesive soils, Meyerhof's coefficient, alpha, betha and lambda method, end bearing capacity, skin friction, negative skin friction Site preparation, foundations construction. Excavation methods, trench excavation, support of excavations, anchoring systems Sheet piling technology, cofferdams, basics of groundwater lowering Pile dimensioning according to Eurocode 7, compressive, tension loading, design of pile groups		
Assessment methods	Lecture Method of projects Continuous assessment of advancing the project Defence of the project and discussion in group Oral completion of the course		
Recommended readings	1. Bowles J. E., Foundation Analysis and Design, McGraw-Hill, 1996, Knovel Release Date 2007-01-02 2. Budhu M., Soil Mechanics and Foundations, John Wiley & Sons, 2007, Knovel Release Date: Aug 5, 2009, Earth Sciences 3. Cernica J. N., Geotechnical Engineering: Foundation Design, John Wiley & Sons, New York, 1995 4. Day R. W., Foundation Engineering Handbook - Design and Construction with the 2006 International Building Code, McGraw-Hill, 2006, Knovel Release Date: 2006-08-09 5. Smith I., Smith's Elements of Soil Mechanics. 8th Edition. Design to Eurokode 7, Blackwell Publishing, Oxford, 2006, 8, VIII-114 6. Tomlinson M. J., Foundation Design and Construction, Prentice Hall, Harlow, 2001, 7 7. Venkatramaiah C., Geotechnical Engineering, John Wiley & Sons, 1993		
Knowledge	Student knows basic solutions of deep foundations systems and relevant codes of practice Student knows codes and guidelines for design and technology of foundation engineering Student knows principles of foundation engineering of building structures. Student knows typical foundation technologies.		
Skills	Student is able to prepare a geotechnical design of a pile foundation under construction and discuss the chosen technologies Student is able to choose a proper foundation technology relevant to a given subsoil condition. Student is competent in communications skills if description and technology of foundation engineering is concern. The English language competence is at least at B2 level. Student is able to make a proper choice of building materials needed in assumed foundation technology.		
Other social competences	Understands and can implement safety rules in deep foundation works		

Course title	Foundations design I - Shallow foundations		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Andrzej Pozlewicz	**E-mail address to the person**	Andrzej.Pozlewicz@zut.edu.pl
Course code (if applicable)	WBiIS-1-48-W	**ECTS points**	5
Semester	winter	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Creating a competence in searching data for given design assumtions with making use of e-books libraries and competence in preparation results preparation in English language. Creating ability to design a shallow foundation for simplified geotechnical conditions. Providing knowledge of various types of shallow foundations used in civil engineering structures.		
Entry requirements	Completed course of engineering geology Completed course of strength of materials Completed course of theoretical mechanics English language competence at B2 level Completed course of soil mechanics Completed course of structural mechanics		
Course contents	Basic geotechnical design of shallow foundations (isolated footing, strip foundation). Draft dimensioning by Terzaghi's equations. Final dimensioning according to Eurocode 7, GEO, EQU, SLS states. Calculations and drawings. Technical descrption of the project Types of shallow foundations, geotechnical categories, estimation of subsoil conditions Technology and methods of design, geotechnical design by calculation General failure mechanism, bearing capacity equations. Prandtl's theory, Terzaghi's equations, Meyerhof's equations, inclined load, Hansen's contribution. Effective values. Geotechnical design of a shallow foundation according to Eurocode 7, Annex D. Partial factors for actions, geotechnical parameters, soil resistance. Design approach: DA1, DA2, DA3. Ultimate Limit States in geotechnical design: GEO, STR, EQU, HYD, UPL. Serviceability Limit States. Layered soils and groundwater level in geotechnical design of shallow foundations Basic methods of groundwater lowering in construction. Stress distribution change in soil at phases of construction. Oedometric modulus and effective parameters, settltment of a single foundation. Site preparation, excavation methods. Major problems in compacted fill technology, fills and fill compaction. Soil exchange method Soil reinforcement technologies.		
Assessment methods	Lecture Method of projects Continuous project assessment Presentation and group discussion Oral completion Continuous assessment of project advancing Defence of the project		
Recommended readings	1. Bowles J. E., Foundation Analysis and Design, McGraw-Hill, 1996, Knovel Release Date 2007-01-02 2. Budhu M., Soil Mechanics and Foundations, John Wiley & Sons, 2007, Knovel Release Date: Aug 5, 2009, Earth Sciences 3. Budhu M., Soil Mechanics and Foundations, John Wiley & Sons, 2011, 3rd Edition 4. Cernica J. N., Geotechnical Engineering: Foundation Design, John Wiley & Sons, New York, 1995 5. Das Braja M., Shallow Foundations. Bearing Capacity and Settlement, CRC Press, 2010, 2nd Edition 6. Day R. W., Foundation Engineering Handbook. Design and Construction with the 2006 International Building Code, McGraw-Hill, New York, 2006, Knovel 7. Smith I., Smith's Elements of Soil Mechanics. 8th Edition. Design to Eurokode 7, Blackwell Publishing, Oxford, 2006, 8, VIII-114 8. Tomlinson M. J., Foundation Design and Construction, Prentice Hall, Harlow, 2001, 7, VIII-861 9. Venkatramaiah C., Geotechnical Engineering, John Wiley & Sons, 1993		
Knowledge	Student knows basic solutions of shallow foundations and subsoil behaviour		
Skills	Student is able to prepare a geotechnical design of a shallow foundation under construction		
Other social competences	Is responsible for own safety and working staff during execution works in foundation engineering		

Course title	Fundamentals of Earth Science		
Level of course	first cycle		
Teaching method	laboratory course / lecture		
Person responsible for the course	Leszek Kaszubowski	**E-mail address to the person**	Leszek.Kaszubowski@zut.edu.pl
Course code (if applicable)	WBiIS-1-11-WS	**ECTS points**	3.0
Semester	winter/summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Knowledge about the main minerals of the magmatic, sedimentary and metamorphic rocks. Understending the magmatic, sedimentary and metamorphic processes. Knowledge about uncohesive and cohesive soils.		
Entry requirements	Without the initial requirements.		
Course contents	Practical recognition and description of the main minerals. Practical recognition and description of the magmatic rocks. Practical recognition and description of the sedimentary rocks. Practical recognition and description of the metamorphic rocks. Practical recognition and description of the uncohesive soils. Practical recognition and description of the cohesive soils. Final test. Main minerals of the magmatic, sedimentary and metamorphic rocks. Magmatic processes and rocks. Sedimentary processes and rocks. Metamorphic processes and rocks. Uncohesive soils and their geotechnical parameters. Cohesive soils and their geotechnical parameters. Theory of tectonic plates. Fluvial erosion, marine abrasion and glacial erosion. Final test.		
Assessment methods	Lectures and projects. Presentation and tests. Final test.		
Recommended readings	1. Keller E.A., Environmental Geology. 8th Edition, Prentice Hall, New York, 2000 2. Legget R.F., Hatheway A.W., Geology and Engineering. 3rd Edition, McGraw-Hill Book Company, New York, 1988 3. McLean A.C.,Gribble C.D., Geology for Civil Engineers., George Allen&Unwin, London-Boston-Sydney, 1979 4. Spencer E.W., Introduction to the structure of the Earth., McGrow-Hill Book Company, New York, 1988		
Knowledge	Student has the basics associated with magmatic rocks and processes, sedimentary rocks and processes, metamorphic rocks and processes. He has aknowledge of the most important exogenous processes occuring on the Earth. He can recognize macroscopically the main minerals, igneous rocks, sedimentary rocks and metamorphic rocks and organic, uncohesive and cohesive soils.		
Skills	Students have a practical knowledge that allos them to solve practical tasks from the Earth science.		

Course title	Geoengineering		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Andrzej Pozlewicz	**E-mail address to the person**	Andrzej.Pozlewicz@zut.edu.pl
Course code (if applicable)	WBiIS-1-12-WS	**ECTS points**	3.0
Semester	winter/summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Create an abillity to proper use of methods of subsoils modification and improvement with respect to geotechnical conditions and actions. Create competence in searching data, e-books, preparation and presentation of project results and draw the conclusions in English language.		
Entry requirements	Completed course of engineering geology Completed course of strength of materials Completed course of foundation engineering English language skills at B2 level		
Course contents	Basic design of subsoil modification with slope stability and cofferdam design. Purpose and methods of soil improvement technologies for different soil and water conditions. Basic methods of modification of subsoil. Soil densification, shallow and deep soil exchange. Soil consolidation methods. Major problems in compacted fill technology, fills and fill compaction. Soil reinforcement technologies. Sheet piling design and technology, cofferdams, waling construction, cantilever walls, anchored retaining walls. Anchoring systems technology. Grouting technology. Basic methods of groundwater lowering in construction.		
Assessment methods	Lecture Methods of projects Continuous project assessment Presentation and group discussion Oral completion		
Recommended readings	1. Ou Ch-Y, Deep Excavations. Theory and Practice, Taylor & Francis, London/Leiden/New York/Philadelphia/Singapore, 2006 2. Bowles J. E., Foundation Analysis and Design, McGraw-Hill, 1996, Knovel Release Date 2007-01-02 3. Budhu M., Soil Mechanics and Foundations, John Wiley & Sons, 2007, Knovel Release Date: Aug 5, 2009, Earth Sciences 4. Cashman P. M., Preene M., Groundwater Lowering in Construction. A practical guide, Spon Press, London, New York, 2001 5. Cernica J. N., Geotechnical Engineering: Foundation Design, John Wiley & Sons, New York, 1995 6. Kalinski M. E., Soil Mechanics. Laboratory Manual, John Wiley & Sons, Hoboken, New Jersey, 2005, Knovel 7. Smith I., Smith's Elements of Soil Mechanics. 8th Edition. Design to Eurokode 7, Blackwell Publishing, Oxford, 2006, 8, VIII-114 8. Venkatramaiah C., Geotechnical Engineering, John Wiley & Sons, 1993		
Knowledge	Student knows soil improvement technologies with respect to designed construction		
Skills	Student is able: to propose a proper soil improvement technology for given geotechnical and geological data with respect to load distribution, estimate the effect of underground water lowering for neighbouring constructions		
Other social competences	Is responsable for own safety and staff during geoengineering works		

Course title	Heat Sources		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Dorota Leciej-Pirczewska	**E-mail address to the person**	Dorota.Leciej-Pirczewska@zut.edu.pl
Course code (if applicable)	WBiIS-1-13-W	**ECTS points**	5.0
Semester	winter	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Knowledge of central heating station equipment Student has got the competence to central heating station design		
Entry requirements	Thermodynamics, Fluid Mechanics		
Course contents	Project of central heating station Mineral, liquid and gas fuel. Fuel storage and transport. Fuel units and installations selection. Fuel burning. Combustion products Boilers and burners construction. Heat sources rooms. Central heating station’s equipment selection. Thermal stations. Heat distribution networks.		
Assessment methods	Lecture, Project Lecture: oral exam		
Recommended readings	1. Kreider J.F, Handbook of Heating, Ventilation and Air Conditioning		
Knowledge	Knowledge of central heating station equipment		
Skills	Student has got the competence to central heating station design		
Other social competences	Student understands the responsibility for the consequences of engineering activity and its impact on the environment		

Course title	Highway Engineering		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Janusz Hołowaty	**E-mail address to the person**	Janusz.Holowaty@zut.edu.pl
Course code (if applicable)	WBiIS-1-14-WS	**ECTS points**	5
Semester	winter/summer	**Language of instruction**	english
Hours per week	5	**Hours per semester**	75
Objectives of the course	Understunding highway structures and their elements. Preparing a simple highway design.		
Entry requirements	Technical drawings, CAD preferable. Geometry.		
Course contents	Range of course. Recommended liiterature. Rural and urban roads. Typical cross section of highways. Existing, design and under construction road examples. Basic phisical elements of a highway. Traffic lanes, shoulders, hard shoulders, emargency lanes and central reserves. Right-of-way and its boundary. Additional elements in Right-of-way. Range and requirements for project works. Discription of basic terms and definitions. Introduction to the technical requirements for public roads. Rules for execution of technical drawings. Preliminary determination of crown elements. Materials for a road pavement. Traffic category planning. Selection of road pavement according the catalog. Rules for surface drainges of highways. Cross slopes for carriageways and shoulders. Ditches and canalizations. Rules for normal cross section of a road. Edges of carriageway: widenings and restraints. Checking of drawings and pavement type. Planting and vegetation. Integration with rural landscape. Enviromental barriers. Rules for superelevated road cross section. Selecting the cross slope of a carriageway. Shaping the road cross section. Checking and correction of drawings. Road clearances. Traffic safety devices on highways. Basic rules for developing highway restraint systems for vehicles. Working length of safety barriers. Road side barriers. Localization of safety barriers, starting segments and end segments. Minimal length of safety barriers. Protection barriers. Project work tests. Checking og design drawings. Using divided cross sections of highways. Simplified capacity of highways. Summary, final checking of design drawings. Additional safety elements for highways. The course range and basic topics. Recommende literature. Highway administration in Poland and all over the world. Road network in Szczecin and in Western Pomerania. Development of highway network in Poland and over the wold. Rual and ubarban roads. Basic elements of highway planning. Basic elements of a highway in a cross section. Single and dual highways. Normal i superelevated cross section of a highway. Basic materials in highway construction. Aggregates, bitumen and ihydraulic binders. Types of road pavements. Types of asphalt mixures. Highway pavement structure. Materials for pavement coures. Standard solutions from pavement catalogs. Enviroment in highways. Impact of construction and service of highway. Noise quality.		

	Test No. 1. Elements of geometric alignment and design of highways. Selection of a highway cross section to traffic volume. Categories and technical classes of highways. Basic parameters for highway design. Influence of highway elements and their location on the highway capacity. Drainage systems for highways. Surface and subsurface drainge. Protection of water. Engineering structures in highway drainage. Road safety. Basic parameters for safety of road traffic. Influence of road parameters on traffic safety. Travel speed and time of travel. Control systems for traffic Safety system for traffic. Roules for a road side design. Soils in highway engineering. Basic classificafion of soils and their usage. Soil and water condition assessment. Frost heave and weak soils. Basic of highway construction. Subgrade preparation and stabilization. Soils for embarkment construction. Execution of cuttings. Drainage at construction time. Materials for roadbase. Surfacing - materials and constructions. Maintenance of highways. Defects assessment and determination of repair range. Repair of pavements. Winter maintenance of highways. Test No. 2. Basic of highway intersections. Types of roundabouts. Traffic signalization. Summary. History of road construction.
Assessment methods	Information lecture Problem lecture Project method Lecture credit Lecture and project tests Project work execution
Recommended readings	1. Martin Rogers, Highway Engineering, Blackwell, Oxford-Singapore, 2008, Second Edition 2. Roger L. Brockenbrough, Highway Engineering Handbook, McGraw Hill, London-Singapore, 2009, Third Edition 3. Manual for Streets, Thomas Telford, London, 2007
Knowledge	Basic knowledge of highway engineering and material used in highway construction
Skills	Can use basic road material standards and technical requirements.
Other social competences	Obtain the base for permanent learning

Course title	Hydrogeology		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Leszek Kaszubowski	**E-mail address to the person**	Leszek.Kaszubowski@zut.edu.pl
Course code (if applicable)	WBiIS-1-15-WS	**ECTS points**	3.0
Semester	winter/summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Knowledge about the main hydrogeological structures. Practical solving of the hydrogeological problems. Understanding the hydrogeological conditions on the base of geological and hydrogeological maps.		
Entry requirements	Finished course of Engineering Geology.		
Course contents	Determination of filtration coefficient by the aid of empiric methods. Construction of hydrogeological cross-sections on the base of geological drillings. Construction of water table and hydro-isobaths maps. Calculation of delivery for uncompleted well and delimitation of the depression curve. Calculation of delivery for a complete well and delimitation of the depression curve. Elaboration of simplified hydrogeological opinion of study area on the base of geological and hydrogeological maps. Final test. Groundwater occurrence: Zone of aeration, zone of saturation, artesian water. Elementary theory of groundwater flow. Methods of determination of filtration coefficient. Groundwater in nonindurated sediments. Groundwater in sedimentary, magmatic and metamorphic rocks. Groundwater resources and environmental management. Analyse of hydrogeological conditions of the study area on the base of geological and hydrogeological maps. Final test.		
Assessment methods	Information lecture and project exercises. Final tests.		
Recommended readings	1. Cashman P.M., Preeme M, Groundwater Lowering in Construction., A Practical Guide.Spon Press., London, 2001 2. Davis S.N., DeWiest R.J.M., Hydrogeology., Krieger Publishing Company., Florida, 1991 3. Keller E.A., Environmental Geology. 8th Edition., Prentice Hall, New York, 2000 4. Legget R.F., Hatheway A.W., Geology and Engineering., McGraw-Hill Book Company, 3th Edition., New York, 1988 5. Sarsby R., Environmental Geotechnics., Thomas Telford., London, 2000		
Knowledge	Student knows the main types of groundwater, their occurence and conditions. He has a basic knowledge related to the theory of groundwater flow and the occurrence of major hydrogeological structures.		
Skills	Student can describe the main types of groundwater. He can use the basic theory of groundwater flow. He has the ability to recognize major hydrogeological structures.		
Other social competences	Student understands, how the main types of groundwater are formed. He has an aware of the basic rights responsible for the groundwater movement.		

Course title	Hydrology		
Level of course	first cycle		
Teaching method	lecturing course / lecture		
Person responsible for the course	Robert Mańko	**E-mail address to the person**	Robert.Manko@zut.edu.pl
Course code (if applicable)	WBiIS-1-42-WS	**ECTS points**	2
Semester	winter/summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	To provide knowledge on hydrological processes as a basis of water management enterprises		
Entry requirements	Basic knowledge of mathematics and physics with elements of differential and integral calculus		
Course contents	Measurement methods and instruments in the field of hydrometeorology, meteorological information Measurement methods and instruments in the field of surface water hydrology, hydrological information Test of knowledge in the field of methods and measuring instruments Development of output tables with daily hydrological data Development of stages and flows hydrgraphs Development of the water-gauges-relations rating curves Development of the stage-outflow rating curve Development of the runoff coefficient for the catchment area Test of knowledge of hydrological curves Hydrological cycle and processes, water balance Hydrological measurements Precipitation and its characteristics Retention and detention - types, assessment methods Outflow - features, characteristics, hydrological curves Statistics in hydrology, probability curves Sediment transport in alluvial streams, methods of assessment Selected problems of river morphology Final assessment		
Assessment methods	Lectures Seminars Written confirmation of the lectures' content knowledge		
Recommended readings	1. Hydrology Handbook (2nd Edition), ASCE, 1996		
Knowledge	Basic knowledge of hydrological processes		
Skills	Posesses skills of hydrological processes analysis in a catchment as a foundation to water management enterprises		
Other social competences	Understands necessity of further deepening of hydrological knowledge		

Course title	Industrial Steel Structures		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Wiesław Paczkowski	**E-mail address to the person**	Wieslaw.Paczkowski@zut.edu.pl
Course code (if applicable)	WBiIS-1-16-L	**ECTS points**	3.0
Semester	summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	The aim of the subject is to familiarize the students with a typical case of structural design in 3D. Doing that the students get the understanding of the designer's role in the total process of investment. The lucture is extended by the desription of other typical industrial objects including also managerial aspects of design and erection./ Celem przedmiotu jest zapoznanie studentów organizacji i zarządzania z klasycznym przypadkiem wymiarowania przestrzennych konstrukcji stalowych. Na przykładzie wykonywanego przez studentów projektu hali przemysłowej studenci nabierają zrozumienia roli projektowania złożonych obiektów budowlanych w całości procesu inwestycyjnego. Wykład uzupełniony jest o opis innych typowych obiektów przemysłowych, także pod kątem organizacji ich projektowania i wznoszenia.		
Entry requirements	Mathematics/ Matematyka Descriptive geometry/ Geometria wykreślna Strength of materials/ Wytrzymałość materiałów Structural mechanics/ Mechanika budowli Basic course of steel structures/ Podstawowy kurs konstrukcji metalowych		
Course contents	Design of a simple industrial building Industrial workshops and halls: anatomy of the structure, loads, cladding, investment process aspects Steel storage tanks Industrial chimneys Trestle bridges		
Assessment methods	Lecture/ Wykład informacyjny Design classes/ Ćwiczenia projektowe Passing the project/ Zaliczenie projektu Passing the lecture/ Zaliczenie wykładu		
Recommended readings	1. Dowling P.J., Knowles P.R., Owens G.W., Structural Steel Design, Butterworths, London 2. Bates W., Design of structural steelwork. Workshop with EOT crane, Constrado, Croydon 3. Łubiński Mieczysław i współaut., Konstrukcje metalowe, cz.II, Arkady, Warszawa, 2004		
Knowledge	W wyniku odbytych zajęć student posiada wiedzę związaną z problemami projektowania złożonych konstrukcji stalowych, gdzie bazując na odpowiednich normach jest w stanie wykonstruować określony obiekt budownictwa przemysłowego (halę) i uwzględnić wpływ przyjętych rozwiązań na jego realizację		
Skills	Student posiada umiejętność zaprojektowania względnie prostej konstrukcji inżynierskiej uwzględniając działające na nią obciążenia i dokonać oceny ze szczególnym uwzględnieniem wpływu stosowanych rozwiązań na proces inwestycyjny As a result of the course the student will hold the knowledge of the problems of designing complex steel structures, where based on the relevant standard is able to design specified object industrial building (hall) and the impact of the solutions adopted for its implementation.		
Other social competences	Dzięki pracy w zespołach o międzynarodowym składzie student nabiera zrozumienia wagi własnych działań w kontekście osiągów zespołu, w którym pracuje		

Course title	Introduction to Eurocodes		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Janusz Hołowaty	**E-mail address to the person**	Janusz.Holowaty@zut.edu.pl
Course code (if applicable)	WBiIS-1-36-WS	**ECTS points**	3
Semester	winter/summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Undestanding of structural Eurocodes. Design of simple structural concrete and steel elements.		
Entry requirements	Building structures. Strength of materials.		
Course contents	Introduction. Codes and standards. Loads and actions. Limit state design philosophy. Partial factors for loads. Determing loads. Structural analysis of beams. Checking of excercises. Design of beams for bending moments. Elastic and plastic stresses in beams. Structural materials and their main properties. Combination expressions. Example - design loads for simply supported beam. Reinforced concrete members. Design of beams for bending moments. Compression members. Checking of projects. Summary. The Eurocodes history and program. Basic assumptions. Principles and application rules. Benefits and threats. Key aspects of the Eurocodes. EN 1990: Basis for structural design - general assumptions. Terminology, symbols and conventions. Harmonization of Eurocodes. Eurocode structures. Classification of actions. Verification of actions. Combination of actions for design. Design situations. Limits states. Loadings on structures - dead and variable loads. Use of EN 1991. Traffic loads. Floor load distributions. Load arrangment. Enviromental loads. Types of strucural elements. Loads paths. Simplified analysis of structural members. Design rules for structural members. Design of simple structural members. Introdution to design of engineering structures. Summary.		
Assessment methods	Lecture credit Lecture and excercise tests Excercise practise Lecture credit Lecture and excercise tests Excercise practise		
Recommended readings	1. The Essential Guide to Eurocodes Transition, BSI, London, 2010 2. Draycott T., Bullman P., Structural Elements Design Manual. Working with Eurocodes, BH, Oxford, 2009, 2 3. Araya Ch., Design of Structural Elements, Spon Text, London, 2009, 3		
Knowledge	Basic knowledge of structural Eurocodes, their structural parts and unserstanding of their usege.		

	Elementary usage of Eurocodes in designing of structural concrete and structural steel elements.
Skills	Can use basic parts of Eurocodes
Other social competences	Obtain the basis for further development of Eurocodes

Course title	Negotiations and Conflict Management		
Level of course	first cycle		
Teaching method	lecturing course / lecture		
Person responsible for the course	Magdalena Bochenek	**E-mail address to the person**	Magdalena.Bochenek@zut.edu.pl
Course code (if applicable)	WBiIS-1-44-WS	**ECTS points**	3
Semester	winter/summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Upon successful completion of this course, the students will be able to identify and employ effective communication, problem-solving, and influence techniques appropriate to a given situation.		
Entry requirements	Basic knowledge of conflict resolution		
Course contents	Practice negotiating with role-playing simulations Develop and execute effective negotiation strategies and tactics for different scenarios Identify and employ effective communication, problem-solving, and influence techniques appropriate to a given situation Introduction and course overview Theory, processes, and practices of negotiation and conflict resolution Negotiation theory – strategies and styles Different types of business negotiations Verbal and nonverbal communication Conflict management and conflict resolution Communication in conflict management Conciliation and mediation Motivation		
Assessment methods	lecture exercise case study written exam		
Recommended readings	1. Zartman W, Negotiation and Conflict Management: Essays on Theory and Practice, Routledge, 2009		
Knowledge	Student has the basic knowledge about effective communication, problem-solving, and influence techniques appropriate to a given situation.		
Skills	The student should be able to negotiate.		
Other social competences	The student proceed according to the rules of ethics.		

Course title	Numerical Methods in Engineering		
Level of course	first cycle		
Teaching method	lecturing course / lecture		
Person responsible for the course	Bogdan Ambrożek	**E-mail address to the person**	Bogdan.Ambrozek@zut.edu.pl
Course code (if applicable)	WBiIS-1-38-WS	**ECTS points**	4
Semester	winter/summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	The student will be able to: 1. Use of modern computational and numerical techniques in engineering. 2. Understand how the algorithms work and why numerical algorithms sometimes give unexpected results.		
Entry requirements	Mathematics		
Course contents	Solving systems of linear and nonlinear algebraic equations. Solving linear and nonlinear regression problems. Solving ODEs and PDEs. Solving optimization problems. Solving selected engineering problems using numerical methods. Systems of linear algebraic equations. Systems of non-linear algebraic equations. Interpolation and curve fitting. Numerical differentiation. Numerical integration. Eigenvalues and eigenvectors of matrices. Linear and nonlinear regression. Solutions of ODEs: Runge Kutta, multistep methods, Gear’s algorithm, stiffness and stability of algorithms. Solutions of PDEs: finite difference, finite elements, method of lines, shooting methods. Introduction to optimization.		
Assessment methods	Lecture illustrated by Power Point presentation and computer simulation Laboratory illustrated by computer calculations Periodic assessment of student achievement Lecture: exam at the end of the semester Classes: written test		
Recommended readings	1. Chapra S.C., Canale R.P., Numerical Methods for Engineers, McGraw-Hill, Boston, 1998 2. Rao S.S., Applied Numerical Methods for Engineers and Scientists, Prentice Hall, New Jersey, 1999 3. Rice R.G., Do D.D., Applied mathematics and modeling for chemical engineers, Wiley, New York, 1995 4. Kiusalaas J., Numerical Methods in Engineering with MATLAB, Cambridge University Press, 2005 5. Hicks M.A, Brinkgreve R.B.J., Rohe A., Numerical Methods in Geotechnical Engineering, CRC, 2014		
Knowledge	The student will be able to understand how the numerical algorithms work		
Skills	The student will be able to use computational techniques in engineering.		
Other social competences	The student will be able to use of modern computational and numerical techniques in chemical engineering.		

Course title	Organization of a construction company		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Agnieszka Siewiera	**E-mail address to the person**	Agnieszka.Siewiera@zut.edu.pl
Course code (if applicable)	WBiIS-1-55-WS	**ECTS points**	2
Semester	winter/summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Principles of company management. Knowledge of techno-economic analysis of the profitability of the company. Basic knowledge of costs and incomes in company activities in respect to profit management. Student has got the competence to create a company and run a business		
Entry requirements	the acquaintance of bases of the economy		
Course contents	project of own company: registration, employment plan: organizational chart, financial analysis: calculation of costs / revenues, marketing analysis of the company and its products with the choice of strategy Company management: registration and types of running a business; owners/partners/shareholders and company's bodies: management board and supervisory board; sources of financing for the company and its projects; financial standing of the company: financial statements, profit and loss account - costs and revenues in the company; end of the financial year - profit distribution in the enterprise, taxes; organization of the company: organizational chart - employment; business strategies / marketing analysis: company's product portfolio, market and competition analysis, risk analysis		
Assessment methods	lecture, discussion, case study analysis of the selected project		
Recommended readings	1. D. Beal, Introducing Corporate Finance, John Wiley & Sons, New York, 2013 2. Commercial law: commercial Companies, 2018 3. A. Damodaran, Corporate Finance, John Wiley & Sons, New York, 2013 4. A. Keown, j. Martin, W. PeD. Scott, Financial Management. Principles and applications, Pearson Education, Inc., New Jersey, 2010 5. F. Lawrence, Go to Market Strategy, Taylor & Francis Ltd, 2010		
Knowledge	Knowledge of techno-economic analysis of the profitability of the company. Basic knowledge of costs and incomes in company activities in respect to profit management.		
Skills	Student has got the competence to create a company and run a business		
Other social competences	Is aware of professional behavior and compliance with the rules of professional ethics, is able to think and act in an entrepreneurial manner		

Course title	Project Management I		
Level of course	first cycle		
Teaching method	lecturing course / lecture		
Person responsible for the course	Krzysztof Tracz	**E-mail address to the person**	Krzysztof.Tracz@zut.edu.pl
Course code (if applicable)	WBiIS-1-17-W	**ECTS points**	4
Semester	winter	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Student to be familiar with methodologies and principles of decision making by Employer Student to be able to assess a project risk		
Entry requirements	Completed course of company organization Completed course of building Economics and works technology		
Course contents	Identification and analysis of different projects stakeholders, Initial phase - technical and financial analysis of Project, Project selection by the Owner - SWOT and PEST analysis Project brief and objectives, Log-frame matrix in PCM methods of Project Management, Milestone schedulling, Work Breakdown Structure (WBS) of the whole project life cycle, Passing test Basic pronciples and definitions of Project Management, Project Life Cycle - examples of different discyplines, Identification of Project stakeholders and analysis of their influence on Project outcome, Basic conditions and constraints in Management of the Project, Planning of Project strategy - main objectives and Project priorities, SWOT and PEST analysis as the base for Project selection by the Owner, Various models of Project Management - optimization of methodology Methodology of process management by Project Management Institute - PMBOK Project scope management by PMI standards, Project life cycle management according to European Commission standards, Structure and principles of Project log-frame procurement, Indicators of Project objectives achievement - SMART test, The other standards of Project Management - ISO 10 006, BS 6079, Prince 2, AGILE Work Breakdown Structure of the whole project life cycle (WBS),		
Assessment methods	lecture exercises written exam case study		
Recommended readings	1. Kerzner Harold, Project Management - A system approach to planning, scheduling and control, John Wiley &Sons, 2003 2. Project Management Institute, A guide to the Project Management Body of Knowledge", 2000 3. Halpin D.W., Woodhead R.W., “ Construction Management”, John Wiley & Sons, 2011 4. Kerzner Harold, Advanced Project Management, John Wiley &Sons, 2004 5. The Chartered Institute of Building, Code Of Practice For Project Management For Construction and Development, Wiley-Blackwell, 2010 6. Rory Burke, Poject Management, Planning and Control, John Wiley&Sons, 1992 7. Nicholas J.M., Steyn H., Projekt management for business, engineering, and technology. Principles and practice., Elsevier Butterworth Heinemann, 2008		
Knowledge	Rozróżnienia cykl życia projektu inwstycyjnego z podziałem na poszczególne fazy, charaktetyzuje mocne i słabe strony projektu, rozpoznaje główne założenia projektu i metody zrządzania		
Skills	Dobiera modele zarządzania projektem na podstawie kryteriów i wymogów zamawiającego,analizuje ryzyko inwestycji i wykonalność techniczną i finansową.		
Other social competences	Jest świadomy zachowań zgodnych z etyką zawodową oraz jest zorientowanyw działaniach dotyczących przedsiębiorczości.		

Course title	Project Management II		
Level of course	first cycle		
Teaching method	lecturing course / lecture		
Person responsible for the course	Krzysztof Tracz	**E-mail address to the person**	Krzysztof.Tracz@zut.edu.pl
Course code (if applicable)	WBiIS-1-18-S	**ECTS points**	6
Semester	summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Student to be familiar with organization and comencemment of construction project Student to be familiar with time management of project		
Entry requirements	Completed course of Project Management I Completed course of Site Management I Completed course of Quality Managenebt Systems		
Course contents	Network schedules for the whole life-cycle of the Project, Development of Project Management Plan (PMP) for construction process, Project costs control in the whole life cycle, Calculation of project activities progress by means of Percentage Complete method, Earned Value Method with regards to all stages of Project, Control of project execution, The life cycle of construction Project, Basic functions of Employer in construction process, The principles of time management in various stages of construction process, The principles of Project Management Plan development, Basic concepts and definitions of the Leadership Project team organisation, Responsibility Allocation Matrix (RAM) of Project - trainning, certificates, up-grading, The scope of project technical dokumentation in comparison of execution effectiveness, Trends` analysis of Activities progress with regards to base-line Plan, Financial analysis of project progress during execution stage - Earned Value Method		
Assessment methods	lecture exercises case study written exam		
Recommended readings	1. Kerzner Harold, Project Management - A system approach to planning, scheduling and control, John Wiley &Sons, 2003 2. Kerzner Harold, Advanced Project Management – edycja polska, John Wiley &Sons, 2004 3. Rory Burke, Project management – planning and control, John Wiley &Sons, 1993		
Knowledge	Rozpoznaje potrzeby zasobów niezbędnych do realizacji inwestycji, definiuje i kontrolujekosztybudowy zgodnie z harmonogramem		
Skills	Tworzy zespół do realizacji projektu budowlanego, sporządza harmonogram działań inwestycyjnych.		
Other social competences	Jest świadomy zachowania w sposób profesjonalny, jest zdolny do podejmowania decyzji w zakresie usprawnienia procesu inwestycyjnego.		

Course title	Quality Management Systems		
Level of course	first cycle		
Teaching method	lecturing course / lecture		
Person responsible for the course	Krzysztof Tracz	**E-mail address to the person**	Krzysztof.Tracz@zut.edu.pl
Course code (if applicable)	WBiIS-1-19-W	**ECTS points**	5.0
Semester	winter	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Student to be familiar with quality procedures according to ISO 9001 Student to be able for working-out of Quality Planning		
Entry requirements	Completion of Comprehensive Building course Completion of company organization course		
Course contents	Family of standards ISO-9000 Developing of Quality Policy - examples of different organisations, Quality procedures in accordance with standard ISO 9000 Quality procedures structure in construction company - examples, Construction works Quality Plan Operational Instructions, Quality records, Pareto analysis, Ishikawa diagram Improving of quality - brain storm, comparison in couples, Basic statistic calculations for Quality system - examples Passing test History and evolution of quality concepts - quality standards and their basic description, Classic approach to quality by W.E. Deming, Changes to the approach of quality problems affected by market processes, Quality costs vs. business efficiency of the company, 8 quality principles as the base of management system, Basic tools of quality management – Fishbone diagram, Pareto analysis, statistic methods, Basic principles of total quality management (TQM) in construction, Definitions and principles of standards ISO 9000 Process approach in development of quality system in construction company, Fundamentals of quality assurance system QAS documentation according to ISO 9001 : 2008. Quality Policy of construction company. Procedures and instructions of QAS. Quality records. Lecture test		
Assessment methods	Informative lectures case studies testing of knowledge Tutorials pass		
Recommended readings	1. Flood Robert L., Beyond TQM, John Wiley & Sons, 1994 2. Georg Stephen, Weimerskirch Arnold, Total Quality Management, John Wiley & Sons, 1994 3. joint publication, English for construction managers and engineering. Part 8: Quality management in construction, Poltext, Warszawa, 2009 4. joint publication, ISO 9000:2005 Quality management systems - Fundamentals and vocabulary, 2005 5. joint publication, ISO 9001:2015 Quality management systems - Requirements, 2015 6. joint publication, ISO 9004:2000 Quality management systems- Guidelines for performance improvements, 2004 7. joint publication, ISO 19011:2018 Guidelines for auditing of Quality Management Systems, 2018		
Knowledge	Zna procedury systemu zarządzania jakością robót budowlanych orza plany jakości dla różnych rodzajów robót budowlanych.		
Skills	Potrafi opracować dokumenty systemu zapewnienia jakości w firmie budowlanej		
Other social competences	Jest odpowiedzialny za pracę własną i wspólnie realizowane zadania, ma świadomość profesjonalnego zachowania i przestrzegania etyki zawodowej		

Course title	Railway Engineering		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Janusz Hołowaty	**E-mail address to the person**	Janusz.Holowaty@zut.edu.pl
Course code (if applicable)	WBiIS-1-20-WS	**ECTS points**	5.0
Semester	winter/summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Unsestending railway structures and their elements. Preparing of simple design of a railway line.		
Entry requirements	Technical drawings, CAD preferable. Geometry.		
Course contents	Introdution to project work. Rules for rail instruction and technical requirements. General rules for selecting a track structure elements. Categories of railway lines and their technical parameters. Typical cross sections for single track railway lines. Clearance for railway lines and railway structures. Selection of the ballast type and its depth. Selection of elements for track structure. Types of railway sleepers and their application range. Initial selection of a railway line cross section. Preparing of formation cross section at bank and in cutting. Selection of cross slopes and calculation of levels. Railway track gauge development. Widening of track on curves. Checing and correction of technical drawings. Initial selection of superelevated cross section on horizontal curvature. Cant and widening of track gauge on curves. Extra clearance on curves. Safe speed on curves. Preparing of a superelevated cross section on a horizontal curve. Geometric alignment of railway lines. Minimal redius according category of a railway line. Service parameters for geometry of a railway line. Vertical alignment of railway lines. Minimum and maximum gradients. Minimal radius values for vertical curves. Track and station drainage. Surface and sub-surface drainge. Ditches, draunage pipes and wells, drainage systems. Acceptance of project work. Final correction of technical drawings. Project work summary. Discussion of problems and mistakes. Basic of non-ballasted tracks. Scope of the course, recommended literature. Instructions used in construction and maintenance of railway lines. History and development of the rail transport. Actual condition of railway lines in Poland and over the world. Financining and rail administration. Service parameters of railway lines. Types of rail traffic. Qualification of railway lines: categories and technical classes. Users and menagment of railway lines. General guidance for railway infrastructure planning. Chosing a route and a profile for a railway line. Railway stations. Passenger traffic. Lifts, escalators and pumps. Air conditioning. Platforms, subways and footbridges. History of track construction. Early rails and supporting elements. Clasiffication of track structures - technical classes. Railway track gauges: narrow, standard and broad. Diffrent gauges in different coutries or regions. Basic elements of the track structure. Ballasted and non-ballasted tracks.		

	Materials for ballast. Types of sleepers. Rail sections and characteristic parameters. Type of rail fastenings, baseplates and pads. Rail joints. Functions of sleepers. Subgrade and formation. Slopes of formation. Execution of earthwork in embakments and cutting. Track alignment design parameters. Gradients. Ruling gradients. Pusher or helper gradient. Plain lines. Swiches and crossings. Curves and superelevation. Redius of a horizontal curve. Cant. Cant deficency and excess. Vertical curves. Railway lline cross sections: double track and single track sections. Technical examples. Technology of railwayworks. Building a new track. Rehabilitation and renewal of track. Test. Types of soils and earthwork. Track drainage. Strengthening of soils. Course summary.
Assessment methods	Information lecture Problem lecture Project method Lecture credit Lecture and project tests Project work execution
Recommended readings	1. Clifford F. Bonnett, Practical Railway Engineering, Imperial College Press, London, 2010, 2nd Edition 2. Satish Chandra & M.M. Agarwal, Railway Engineering, Oxford University Press, USA, 2013, 2nd Edition
Knowledge	Basic knowledge of railway engineering and materials used in railway construction
Skills	Can use technical standards for railway engineering
Other social competences	Obtain the basis for development of railway standards and requirements.

Course title	Roads, streets and junctions		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Janusz Hołowaty	**E-mail address to the person**	Janusz.Holowaty@zut.edu.pl
Course code (if applicable)	WBiIS-1-21-WS	**ECTS points**	5
Semester	winter/summer	**Language of instruction**	english
Hours per week	5	**Hours per semester**	75
Objectives of the course	Understanding the principles of design of roads, streets and junctions		
Entry requirements	Basic civil engineering knowledge. Basic drawing skills in Cad software		
Course contents	Introduction to project work. Project subject Examples of streets - design parameters Designing the street cross sections Basic definitions and parameters regarding roads, streets and junctions Categories and technical classes of roads and streets, Street functions Guidelines to street designs Footways, cycle paths and parkings Street Specifications Types of intersections Drainage of roads and streets		
Assessment methods	Lecture Workshop Grade Project work		
Recommended readings	1. Corporate author, A Policy on Geometric Design of Highways and Streets, AASHTO, Washington, 2004 2. Edited by W.F. CHEN, J.Y. Richard Liew, , The Civil Engineering Handbook, CRC Press, Boca Raton, London, New York, Washington, D.C., 2003 3. Reinhold Baier et al., Directives for the Design of Urban Roads, RASt 06, FGSV, Cologne, 2006		
Knowledge	Student knows the technical guidelines used in the design of various junctions and intersections. Knows the basic principles of developing and printing road drawings using the CAD software.		
Skills	Student can design a street intersection. Can read surveying maps and construction drawings.		
Other social competences	Understand the responsibility for the consequences of engineering activity and its impact on the environment.		

Course title	Site Management I		
Level of course	first cycle		
Teaching method	lecturing course / lecture		
Person responsible for the course	Krzysztof Tracz	**E-mail address to the person**	Krzysztof.Tracz@zut.edu.pl
Course code (if applicable)	WBiIS-1-22-W	**ECTS points**	5.0
Semester	winter	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	Students to be familiar with preperation and execution process by the Contractor Knowledge of scheduling of construction works Assessement of risk during the executiond of the works		
Entry requirements	Completed course of Construction companies organization Completed course of building Economics		
Course contents	Documents for taking-over of construction site, Organization charts of construction site, Construction Works quantities and time calculations, Developing of barchart, Resource histogram, Development of safety Plan (BIOZ) Building materials` stockyards, Construction site layout, Passing test Legal and contractual aspects of construction works commecement, Procedure of mobilization and taking-over of construction site, Planning and organisation of technical infrastructure on site, Planning of optimal technology of construction works, Identification of detailed scope of works - WBS Scope of duties and responsibilities of key positions of Contractor on site, Safety Plan BiOZ complient with technical and legal requirements, Planning of equipment and human resources necessary for contractual scope of works, Gantt`s chart - key dates of construction works, Line of balance in site human resources histogram, Scope of duties and interpersonal stipulation for site manager,		
Assessment methods	Informative lectures Case studies Testing exam for lectures Tutorials assessement		
Recommended readings	1. Rory Burke, Project Management Planing and Contraction, John Wiley & Sons, 1992 2. Andersson C.A.,Miles D., Neale R., Ward J., Site management. Workbook., Ineternational Labour Office, Geneva, 1996 3. Praca zbiorowa, English for construction managers and engineering. Part 2: Principles of the management in construction., Poltext, Warszawa, 2008 4. Kerzner H., Project Management. A system approach to planning,scheduling and controlling., John Wiley& Sons, Inc. New Jersey, 2003 5. Maj T., Organizacja budowy. Podręcznik., Wyd. Szkolne i Pedagogiczne Spółka Akcyjna, Warszawa, 2007		
Knowledge	Rozróżnia struktury oganizacjyjne budów o różnej skali wielkości, proponuje rozwiązania organizacji i zagospodarowania placu budowy, dobiera metodologię wykonania robót dla róąnych projektów.		
Skills	Oblicza nakłady pracy dla poszczególnych rodzajów robót,planuje pracę grup roboczych na placu budowy, ocenia zagrożenia i podejmuje działania zabezpieczające.		
Other social competences	Jest odpowiedzialny za bezpieczeństwo własne i zespołu,jest odpowiedzialy za wspoólnie realizowane zadania, ma świadomość przestrzegania etyki zawodowej		

Course title	Site Management II		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Krzysztof Tracz	**E-mail address to the person**	Krzysztof.Tracz@zut.edu.pl
Course code (if applicable)	WBiIS-1-23-S	**ECTS points**	3.0
Semester	summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Student to be familiar with construction technology and planning of basic resources Working-out of construction schedules		
Entry requirements	Passing of the course - Site Management I Passing of the course - Project Management I		
Course contents	Construction schedulling with MS Project software, Elaboration pass, Fundamentals of time management of construction site activities - types of schedules and their application, Critical Path Method (CPM) – the principles of network schedulling, Basic relationships between activities in construction network schedulling with MS Project, The calculation methods of construction works timing, Development and optimization of human resources diagram, Balancing of employment with regards to critical path and building costs, Optimization of Project schedule - methods of improvement,		
Assessment methods	Informative lectures Projects` methodology Examination test Case study pass		
Recommended readings	1. Rory Burke, Project Management Planing and Contraction, John Wiley & Sons, 1992 2. Andersson C.A.,Miles D., Neale R., Ward J., Site management. Workbook., Ineternational Labour Office, Geneva, 1996 3. Praca zbiorowa, English for construction managers and engineering. Part 2: Principles of the management in construction., Poltext, Warszawa, 2008 4. Kerzner H., Project Management. A system approach to planning,scheduling and controlling., John Wiley& Sons, Inc. New Jersey, 2003		
Knowledge	Znajomość metod planowania oraz identyfikacji parametrów projektu krytycznych dla terminowego i efektywnego wykonania robót na budowie		
Skills	Sporządzanie harmonogramów szczegółowych dla robót budowlanych za pomocą programu MS Project		
Other social competences	Odpowiedzialny za bezpieczeństwo własne i zespołu oraz zapowierzone mu zadania, przestrzega eyyki zawodowej.		

Course title	Soil Mechanics		
Level of course	first cycle		
Teaching method	lecturing course / laboratory course / lecture		
Person responsible for the course	Andrzej Pozlewicz	**E-mail address to the person**	Andrzej.Pozlewicz@zut.edu.pl
Course code (if applicable)	WBiIS-1-27-WS	**ECTS points**	4
Semester	winter/summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	To understand the basic description of soil mass with affecting external loads to estimate strength properties of soil based on the results of tests To apply the knowledge of soil behaviour to geotechnical design		
Entry requirements	Completed course of engineering geology Completed course of strength of materials Completed course of theoretical mechanics English language competence at B2 level Completed course of structural mechanics		
Course contents	Discussion on soil parameters, soil clasiffication analysis, calculation of parameters, calculations of stresses due to point loads, rectangular unit loads, analysis of vertical stress distribution at various stages of construction. Settlement and consolidation calculations. Shear strength calculations, principal stress. Active and passive earth pressure calculations, resultant diagram and force. Laboratory tests of soil paramaters (sieve analysis - grain size distribution, water content, density, Atterberg limits, shear strength tests, Proctor test, oedometric tests, permeability coefficient, density index) Basic characteristics of soil, deposits, origin, three-phase nature of soils Physical properties of soil (density, unit weight, porosity, void ratio, water content, Atterberg limits, density index, plasticity index, consistency index, grain-size distribution, uniformity coefficient) Soil classifications (AASHTO, USCS, EN ISO). Soil compaction. Standard Proctor Test. Factors affecting compaction Hydraulic conductivity and seapage Stresses in soil. Effective stress concept. Stress due to external loading (point load - Boussinesq equation, ractangularly loaded area, circular loaded area). Changes of vertical stress with phases of construction works. Consolidation, normally consolidated and overconsolidated soils, OCR ratio. Introduction to Terzaghi theory of consolidation. Coefficient of consolidation (logarithm of time method, square root of time method). Application to settlement calculations. Oedometric tests Shear strength of soil. Coulomb - Mohr failure criteria. Laboratory determination of shear strength parameters. Direct shear test. Triaxial shear tests (CD-test, CU-test, UU-test). Lateral earth pressure. Rankine's theory of active and passive pressures. Coulomb's theory of earth pressure. Application of pressure distribution diagrams to retaining walls and shallow foundations. Basics of bearing capacity of shallow foundations		
Assessment methods	Lecture Tutorials laboratory Written test of lecture and tutorials content Continuous assessment of laboratory reports written tests of tutorials		
Recommended readings	1. J. A. Knappett and R. F. Craig, Craig's Soil Mechanics, Spon Press, 2012, Eight Edition 2. Budhu M., Soil Mechanics and Foundations, John Wiley & Sons, 2011, 3rd Edition, Knovel, Earth Sciences 3. Smith I., Smith's Elements of Soil Mechanics. 8th Edition. Design to Eurokode 7, Blackwell Publishing, Oxford, 2006, 8, VIII-114 4. Braja M. Das, Fundamentals of Geotechnical Engineering, Cengage Learning, 2013, 4th Edition, International Edition 5. W. Powrie, Soil Mechanics. Concepts and Applications, CRC Press Taylor & Francis Group, 2014, Third Edition 6. Bowles J. E., Foundation Analysis and Design, McGraw-Hill, 1996, Knovel Release Date 2007-01-02 7. Venkatramaiah C., Geotechnical Engineering, John Wiley & Sons, 1993		
Knowledge	Student knows soil clasiffications, basic soil propertis and stress distribution, knows how to calculate earth pressures		
Skills	Student is able to calculate and analyse the results from laboratory testing, is capable to distinguish changes in stresses due to different stages of construction. Student is able to draw a diagram of earth pressures and provide calculations.		
Other social competences	Students is able to predict a soil mass failure on basis of principal theories and understand any danger that may appear for working people. Feels responsible for their safety.		

Course title	Strength of Materials		
Level of course	first cycle		
Teaching method	lecturing course / lecture		
Person responsible for the course	Hanna Weber	**E-mail address to the person**	Hanna.Weber@zut.edu.pl
Course code (if applicable)	WBiIS-1-24-WS	**ECTS points**	5.0
Semester	winter/summer	**Language of instruction**	english
Hours per week	4	**Hours per semester**	60
Objectives of the course	To gain knowledge of simple stresses, strains and deformation in components due to external loads To assess stresses and deformations through mathematical models of beams, torsion bars or combinations of both. Understanding the influence of loads and dimensions of structural elements on the values of stresses and deformations.		
Entry requirements	Mathematics Theoretical mechanics Elementary structural analysis		
Course contents	Axial stretching/compression Simple bending. Bending with shear forces. Oblique bending, bending in two planes. Eccentric stretching/compression. Deflection of beams. Torsion bars with circular cross-section. The stability of a straight bar. Bending with compression. Written tests 2x2h Introductory information: stress, strain, Hooke's law, the basic material constants. Axial stretching/compression Simple bending. Bending with shear forces. Oblique bending, bending in two planes. Eccentric stretching/compression. Deflection of beams. Torsion bars with circular cross-section. The stability of a straight bar. Bending with compression.		
Assessment methods	Information lecture Issue lecture Audio-visual presentation Computational exercises Continuous assessment in practical classes Project work Written exam		
Recommended readings	1. Da Silva V.D., Mechanics and strength of materials, Springer Verlag, 2006 2. Beer F. P., Johnston R., Dewolf J.T., Mazurek D.F., Mechanics of Materials, McGraw-Hill Book Co, 2012, Sixth Edition 3. Nash W.A, Theory and problems in Strength of Materials, McGraw-Hill Book Co, New York, 1995 4. Kazimi S.M.A, Solid Mechanics, Tata McGraw-Hill Publishing Co, New Delhi, 1981 5. Ray Hulse, Keith Sherwin & Jack Cain, Solid Mechanics, Palgrave ANE Books, 2004		
Knowledge	Student has the basic knowledge about axial, torsion, bending and combined stresses, types of strain and elastic behavior of materials.		
Skills	Student is able to analyze and design structural members subjected to axial, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behavior of materials.		
Other social competences	The student is aware of the responsibility for his own calculations		

Course title	Sustainable Water Management		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Dorota Stocka	**E-mail address to the person**	Dorota.Stocka@zut.edu.pl
Course code (if applicable)	WBiIS-1-25-WS	**ECTS points**	3.0
Semester	winter/summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Upon successful completion of this course, the student will be able to: - understand the need for sustainable water management - understand the concept of sustainability and sustainable land development - describe the impact of urban development on the hydrologic sycle and water quality of watersheds and sub-watersheds.		
Entry requirements	Basic Hydrology and hydraulics. Level S1 Civil Engineering		
Course contents	Preparing a conceptual plan of sustainable water management on a single residential lot. Introduction to the concept of sustainability and the idea of sustainable water management. Introduction to the non-traditional "green" infrastructure in water management. Introduction to the major green infrastructure design considerations: environmental protection, stream habitat protection, protection of soils and vegetation, pollution prevention planning, sustainable urban landscape, and subsurface utility engineering.		
Assessment methods	Lecture Presentations and video movies Obtaining grade for project work		
Recommended readings	1. Vallero, Daniel; Brasier Chris, Sustainable Design - The Science of Sustainability and Green Engineering, John Willey & Sons, 2008 2. Develop with Care 2012. Environmental Guidelines for Urban and Rural Land Development in BC, Canada, 2012, on-line pdf document		
Skills	Upon successful completion of this course, the student will be able to: - understand the need for sustainable water management - understand the concept of sustainability and sustainable land development - describe the impact of urban development on the hydrologic cycle and water quality		

Course title	Technology of Foundation Works		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Andrzej Pozlewicz	**E-mail address to the person**	Andrzej.Pozlewicz@zut.edu.pl
Course code (if applicable)	WBiIS-1-26-L	**ECTS points**	3.0
Semester	winter/summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	To provide knowledge on technologies used in foundation engineering Create ability to prepare and make use of presentations skills in English		
Entry requirements	Completed course of engineering geology Completed course of strength of materials Completed course of structural mechanics Completed course on fundamentals of foundation engineering English language skills at B2 level		
Course contents	Basic design of axially loaded pile and sheet piling support of excavation pit. Spread foundation technology. Raft foundations, deep shaft foundations. Site preparation, foundations construction. Excavation methods, trench excavation, support of excavations. Pile technology with various geotechnical conditions. Basics of axially loaded pile design. Static and dynamic test loading. Sheet piling technology, cofferdams, anchoring systems. Basics of groundwater lowering in construction.		
Assessment methods	Lecture Methods of projects Continuous assessment of project development Defence of the project, discussion of results within a group Oral completion		
Recommended readings	1. Bowles J. E., Foundation Analysis and Design, McGraw-Hill, 1996, Knovel Release Date 2007-01-02 2. Budhu M., Soil Mechanics and Foundations, John Wiley & Sons, 2007, Knovel Release Date: Aug 5, 2009, Earth Sciences 3. Cashman P. M., Preene M., Groundwater Lowering in Construction. A practical guide, Spon Press, London, New York, 2001 4. Cernica J. N., Geotechnical Engineering: Foundation Design, John Wiley & Sons, New York, 1995 5. Day R. W., Foundation Engineering Handbook - Design and Construction with the 2006 International Building Code, McGraw-Hill, 2006, Knovel Release Date: 2006-08-09 6. Kalinski M. E., Soil Mechanics. Laboratory Manual, John Wiley & Sons, Hoboken, New Jersey, 2005, Knovel 7. Monahan E. J., Construction of Fills, John Wiley & Sons, 1994, 2, Knovel Release Date: 2007-08-22 8. Smith I., Smith's Elements of Soil Mechanics. 8th Edition. Design to Eurokode 7, Blackwell Publishing, Oxford, 2006, 8, VIII-114 9. Tomlinson M. J., Foundation Design and Construction, Prentice Hall, Harlow, 2001, 7 10. Venkatramaiah C., Geotechnical Engineering, John Wiley & Sons, 1993		
Knowledge	Student knows typical technologies of foundations works		
Skills	Student is able to: prepare a geotechnical design of a foundation under given construction with a proper excavation support if needed, and discuss the chosen technologies		
Other social competences	Understands safety rules in foundation works		

Course title	Technology of Steel Structures		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Małgorzata Abramowicz	**E-mail address to the person**	Malgorzata.Abramowicz@zut.edu.pl
Course code (if applicable)	WBiIS-1-34-S	**ECTS points**	3
Semester	summer	**Language of instruction**	english
Hours per week	2	**Hours per semester**	30
Objectives of the course	Familiarity with manufacture technology of complex structural steelwork; practical skill to design elementary parts of the vertical steel chimney for industry.		
Entry requirements	Mathematics Strength of materials Structural mechanics Rules of design of steelwork Technical drawing		
Course contents	Design of chimney's. Calculation: static-durability of chimney’s parts, montage joints between segments and chimney-foundation connection. Calculation with the rul of Eurocode 3 and Eurocode 1, etc. Introduction to steel’s role in construction industry: mild steel as a backbone of the industry, the world steel production, costs of construction works and steelwork costs, European system of steel grades notation Chimney: classification, basic rules of shell design, foundation connection design, technology of execution. Welding of structural steelwork: welding process and consumables, typical weld details, weld defects and quality control Fabrication: form of contract and organization. Erection: design for erection Corrosion protection: basic theory, paint and metal coatings. Fire protection: regulation requirements, properties of steel, protection of members		
Assessment methods	Information lecture Issue lecture Audio-visual presentation Mark for the design Written tests		
Recommended readings	1. Eurocode 0 – Basis of structural design. 2. Eurocode 1 – Actions on structures. 3. Eurocode 3 – Design of steel structures. 4. EN 13084-1:2007 Free-standing chimneys - Part 1: General requirements. 5. EN 13084-7:2006 Free-standing chimneys - Part 7 Product specifications of cylindrical steel fabrications for use in single wall steel chimneys and steel liners. 6. Owens G. W., Knowles P.R., Dowling P.J., Steel Designers' Manual, Blackwell, Scientific Publications, Cambridge, 2003 7. Dowling P.J., Knowles P.R., Owens G.W, Structural Steel Design, Butterworths, London, 1988 8. Gardner L., Nethercot D. A., Designers Guide to EN 1993-1-1 – Design of steel structres general rules and rules for buldings.		
Skills	As a result of the course the student will hold the knowledge of the organization and management of problems occurring in the implementation of steel structures, where based on the relevant standard is able to design industrial construction of the specified object (chimney) and the impact of typical technologies for its implementation.		

Course title	Theoretical Mechanics		
Level of course	first cycle		
Teaching method	lecturing course / lecture		
Person responsible for the course	Małgorzata Abramowicz	**E-mail address to the person**	Malgorzata.Abramowicz@zut.edu.pl
Course code (if applicable)	WBiIS-1-29-Z	**ECTS points**	4
Semester	winter	**Language of instruction**	english
Hours per week	3	**Hours per semester**	45
Objectives of the course	Ability to identify systems statically determinate and indeterminate The designation of the reaction in various types of structures Determination of forces in truss rods Application of laws of dynamics and kinematics		
Entry requirements	Mathematics Physics		
Course contents	The auxiliary messages from vector calculus. Newton's law. Basic concepts of mechanics. Models of real objects. Principles of statics. Moment of force with respect to the point. Systems of forces. The main vector and main moment. Reduction of the system of forces. Reduction in individual cases systems of forces. The balance of forces converging. Rigid body in the system flat and spatial degrees of freedom, constraints. The balance of flat systems of forces. Conditions of determine static and geometric invariance of the scheme. Methods for determining the forces in truss rods. Fundamentals of mechanics analytical. Kinematics of material point. Selected methods for the description of motion. Speed and acceleration. Kinematics rigid body. Dynamics of material point and the material system. Differential equations of motion. Free movement of damping. Harmonically forced oscillation of a simple example. Written tests 2x2h The auxiliary messages from vector calculus. Newton's law. Basic concepts of mechanics Models of real objects. Principles of statics. Moment of force with respect to the point. Systems of forces The main vector and main moment. Reduction of the system of forces. Reduction in individual cases systems of forces. The balance of forces converging Rigid body in the system flat and spatial degrees of freedom, constraints The balance of flat systems of forces Conditions of determine static and geometric invariance of the scheme Methods for determining the forces in truss rods Fundamentals of mechanics analytical Kinematics of material point. Selected methods for the description of motion. Speed and acceleration. Kinematics rigid body Dynamics of material point and the material system. Differential equations of motion. Free movement of damping. Harmonically forced oscillation of a simple example		
Assessment methods	Information lecture Issue lecture Audio-visual presentation Computational exercises Continuous assessment in practical classes Written exam		
Recommended readings	1. Symon Keith, Mechanics, ADDISON WESLEY PUB CO INC, 1971 2. Stephen T. Thornton, Classical Dynamics of Particles and Systems, 2003 3. J.B. Marion and S.T. Thornton, Classical dynamics of particles and systems, 1995 4. John R. Taylor, Classical Mechanics, University Science Books, 2005 5. Edwin F. Taylor and John Wheeler, W. H. Freeman and Co., Spacetime Physics, 1966		
Knowledge	The student knows how to use the vector employed for determining the response in static and dynamic. The student knows how to determine the characteristics of simple cross-section rods.		
Skills	The student can solve simple static and dynamic rod systems. The student is able to formulate and solve problems with cross-sectional geometry of the rods.		
Other social competences	The student is aware of the responsibility for his own calculations		

Course title	Water Resources Engineering		
Level of course	first cycle		
Teaching method	project course / lecture		
Person responsible for the course	Dorota Stocka	**E-mail address to the person**	Dorota.Stocka@zut.edu.pl
Course code (if applicable)	WBiIS-1-31-WS	**ECTS points**	3
Semester	winter/summer	**Language of instruction**	english
Hours per week	3	**Hours per semester**	45
Objectives of the course	Upon successful completion of this course, the student will be able to: - understand major issues related to water resources engineering - understand the concept of sustainable water resources management - understand the planning and design principles of watr supply, stormwater management, reservoirs, wells, flood mitigation, irrigation and drainage, and hydropower.		
Entry requirements	Basic Hydrology and hydraulics. Fluid Mechanics (open channels aand closed conduits)		
Course contents	Preparing assesments for classes Introduction to water resources management. Investigation of a wide range of water resoures issues, methods of analysis and solutions. Topics include: water distribution systems, hydraulics, surface water hydrology, rainfall and runoff, drainage channels, sanitary sewers, flood control structures, reservoirs, hydrotechnical structures, grandwater, water resources planning.		
Assessment methods	Lecture Presentations and video movies Research on Internet Obtaining grade for assessments		
Recommended readings	1. Vallero, Daniel; Brasier Chris, Sustainable Design - The Science of Sustainability and Green Engineering, John Willey & Sons, 2008 2. Linsley R. K. and Franzini J. B., Water Resources Engineering, McGraw-Hill Book Inc., New York, 1992 3. Chin, David A., Water-Resources Engineering, PEARSON, London, UK, 2013, Third Edition		
Skills	Upon successful completion of this course, the student will be able to: - understand major issues related to water resources engineering - understand the concept of sustainable water resources mngt - understand the planning and design principles of water supply, reservoirs, flood protection, drainage and hydropower		