**Faculty of Civil Engineering and Architecture**

**CIVIL ENGINEERING**

COURSE OFFER FOR EXCHANGE STUDENTS

Academic year: 2014/2015

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| **Course code (if applicable)** | **Course title** | **Person responsible for the course** | **Semester (winter/summer)** | **ECTS points** |
| **FIRST DEGREE** |
| B/S1/53/PDW-8, B/S1/29 | Bridge Engineering | Janusz Hołowaty | Winter/Summer | 5 |
| B/S1/39/PDW-1 | Highway Engineering | Janusz Hołowaty | Winter/Summer | 5 |
| B/S1/40/PDW-2 | Railway Engineerinng | Janusz Hołowaty | Winter/Summer | 5 |
| B/S1/52/PDW-7 | Roads, Streets and junctions | Janusz Hołowaty | Winter/Summer | 5 |
| WBiA/B/S1/OiZ/-/63 | Building Physics II | Karolina Kurtz-Orecka | Winter/Summer | 3 |
| - | Design of Sustainability Buildings | Karolina Kurtz-Orecka | Winter/Summer | 3 |
| WbiA/IŚ/S1/B14 | Fundamentals of Earth Science | Leszek Kaszubowski | Winter | 3 |
| WBiA/B/S1/OiZ/-/50 | Environmental Geotechnology | Andrzej Pozlewicz | Winter | 3 |
| WBiA/B/S1/OiZ/-/51 | Hydrogeology | Leszek Kaszubowski | Winter | 3 |
| - | Heat Sources | Dorota Leciej-Pirczewska | Winter | 5 |
| BIE\_1A\_S/PO3/5 | Site Management I | Krzysztof Tracz | Winter | 5 |
| BIE\_1A\_S/PO3/6 | Contract Procedures | Krzysztof Tracz | Winter | 5 |
| BIE\_1A\_S/PO3/7 | Quality Management Systems | Krzysztof Tracz | Winter | 5 |
| BIE\_1A\_S/C21 | Project Management | Krzysztof Tracz | Winter | 4 |
| WBiA/B/S1/OiZ/-/18 | Theoretical Mechanics | Małgorzata Abramowicz | Winter | 5 |
| WBiA/B/S1/OiZ/-/34 | Basic Steel Structures | Małgorzata Abramowicz | Winter  | 6 |
| WBiA/B/S1/BE/-/40 | Renewable Energy Resources (RENER) | Ewa Figiel | Winter | 3 |
| BIE\_1A\_S/C21 | Project Management II | Krzysztof Tracz | Summer | 6 |
| BIE\_1A\_S/PO9/20 | Site Management II | Krzysztof Tracz | Summer | 3 |
| WBiA/B/S1/OiZ/-/41 | Technology of Special Hydrotechnical Works | Jacek Kurnatowski | Summer | 3 |
| WBiA/B/S1/OiZ/-/42 | Technology of River Regulation Works | Jacek Kurnatowski | Summer | 3 |
| WBiA/B/S1/W/-/26 | Building Installations | Katarzyna Zwarycz-Makles | Summer | 3 |
| WBiA/B/S1/OiZ/-/57 | Geoengineering  | Andrzej Pozlewicz | Summer | 3 |
| WBiA/B/S1/OiZ/-/56 | Technology of Foundation Works | Andrzej Pozlewicz | Summer | 3 |
| WBiA/B/S1/OiZ/-/52 | New Generation of Concrete | Maria Kaszyńska | Summer | 3 |
| B/S1/29 | Basic Concrete Structures | Piotr Brzozowski | Winter/summer | 5 |
| WBiA/B/S1/OiZ/-/55 | Technology of Steel Structures | Wiesław Paczkowski | Summer | 3 |
| WBiA/B/S1/OiZ/-/56 | Industrial Steel Structures | Wiesław Paczkowski | Summer | 3 |
| WBiA/B/S1/DUL/47 | Transportation Planning in Urban Areas | Jacek Czarnecki | Summer | 5 |
| WBiA/B/S1/OiZ/-/31 | Structural Mechanics | Małgorzata Abramowicz | Summer | 4 |
| WBiA/B/S1/OiZ/-/26 | Strength of Materials | Małgorzata Abramowicz | Summer  | 5 |
| - | Construction Technology | Patryk Wolert | Winter/Summer | 2 |
| B\_1A\_S\_C6+C11 | Elementary Structural Analysis | Hanna Weber | Winter/summer | 3 |
| WBiA/B/S1/W/-/31 | Basic of Design of Water Supply and waste Conveyance Systems | Dorota Stocka | Winter/Summer | 2 |
| WBiA/B/S1/W/-/44 | Design of Water Supply and Waste Conveyance Systems | Dorota Stocka | Winter/summer | 5 |
| WBiA/B/S1/W/-/48 | Sustainable Water Management | Dorota Stocka | Winter/Summer | 3 |
| **SECOND DEGREE** |
| WBiA/B/SD/DS/1 | Selected Issues of Water and Waste Water – Sustainable Stormwater Management | Dorota Stocka | Winter/Summer | 5 |
| WBiA/B/SD/DS/2 | Computer Methods in municipal infrastructure Analysis & Design | Dorota Stocka | Winter/Summer | 4 |

**FIRST DEGREE**

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| **Course title** | **Bridge Engineering** |
| **Person responsible for the course** | Dr. Janusz Hołowaty | **E-mail address**  | Janusz.Holowaty@zut.edu.pl |
| **Course code** **(if applicable)** | B\_1A\_S\_DUL\_7 B\_1A\_S\_C11 | **ECTS points** | 5 |
| **Type of course** | compulsory / elective | **Level of course** | S1 |
| **Semester**  | winter / summer | **Language of instruction** | English |
| **Hours per week** | 4 (2L+2W) | **Hours per semester** | 60 (30L+30W) |
| **Teaching method** | Lecture and design exercise |
| **Objectives of the course** | Understanding of bridge structures and their elements |
| **Entry requirements** | Elementary Structural Analysis |
| **Course contents** | History of bridges. Bridge design standards and specifications. Actions on bridges: permanent actions, variable actions and live loads. Road traffic models and railway traffic modelsBasic types of bridge structures. Structural elements of bridge structures. Bridge geometrics. Basic bridge materials. Bridge accessories. Determination of bridge cross sections (road&bridge).Bridge structural systems. Examples of bridge construction.Basic bridge design.Design of slab bridge. |
| **Assessment methods** | Continuous assessment and design exercise |
| **Recommended readings** | 1. Design of Highway Bridges. Wiley. 2007.
2. Bridge Engineering Handbook. CRC. 2000.
3. Planning and Design of Bridges. Wiley. 2006.
 |
| **Additional information** | Further readings1. Design & Construction of Steel Bridges. Taylor&Francis. 2006.
2. Understanding Bridge Collapses. Taylor&Francis. 2006.
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| **Course title** | **ENVIRONMENTAL GEOTECHNOLOGY** |
| **Person responsible for the course** | **Andrzej Pozlewicz** | **E-mail address to the person responsible for the course** | **andpoz@zut.edu.pl** |
| **Course code** **(if applicable)** | **BIE\_1A\_S\_D10** | **ECTS points** | **3** |
| **Type of course** | **Elective** | **Level of course** | **S1** |
| **Semester**  | **Winter** | **Language of instruction** | **English** |
| **Hours per week** | **2** | **Hours per semester** | **30** |
| **Teaching method** | **Lecture (1 hour/week), project (1 hour/week)** |
| **Objectives of the course** | **Create an ability to recognize potential landfill site and its basic construction design** |
| **Entry requirements** | **Soil mechanics, geology, foundation design** |
| **Course contents** | **Geotechnics and the environment, environmental basics, soil investigation for environmental purposes, landfill siting and site investigation, seepage and groundwater control, waste disposal by landfill, clay liners, geomembranes and composite liners, contaminated land, waste materials in geotechnical construction, soil – waste interactions, groundwater lowering in construction, landsubsidence caused by human activities, slurry walls** |
| **Assessment methods** | **Project work, continuous assessment, presentation** |
| **Recommended readings** | * **Cashman P.M., Preene M.: Groundwater Lowering in Construction. A Practical Guide. Spon Press., London, 2001**
* **Cernica J.: Geotechnical Engineering – Foundation Design. Wiley & Sons, 1995**
* **Fang H-Y, Daniels J.L.: Introductory Geotechnical Engineering. An Environmental Perspective. Taylor & Francis. London, 2006**
* **Keller E.A.: Environmental Geology. 8th Edition, Prentice Hall, NJ, 2000**
* **Legget R.F., Hatheway A.W.: Geology and Engineering, McGraw-Hill Book Company, 3rd Edition, NY, 1988**
* **Qian X., KoernerR.M., Gray D.H.: Geotechnical Aspects of Landfill Design and Construction. Prentice Hall, NJ, 2002**
* **Sarsby R.: Environmental Geotechnics. Thomas Telford, London, 2000**
* **Sharma H.D., Lewis S.P.: Waste Stabilization, and Landfills. John Wiley & Sons, NY, 1994**
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| **Additional information** | **The students of ECEM make choice between Environmental Geotechnology and Hydrogeology** |

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| **Course title** | **Highway Engineering** |
| **Person responsible for the course** | Dr. Janusz Hołowaty | **E-mail address**  | Janusz.Holowaty@zut.edu.pl |
| **Course code** **(if applicable)** | B\_1A\_S\_C20 | **ECTS points** | 5 |
| **Type of course** | compulsory | **Level of course** | S1 |
| **Semester**  | winter / summer | **Language of instruction** | English |
| **Hours per week** | 5 (3L+2W) | **Hours per semester** | 75 (45L+30W) |
| **Teaching method** | Lecture and design exercise |
| **Objectives of the course** | Understanding of roads and streets and their elements |
| **Entry requirements** | Engineering geology |
| **Course contents** | History of vehicle transportation. Types of roads and streets. Highways in Poland and Europe. Administration and financing of highways. Highway functions and classifications. Hierarchies of movements. Access and mobility. Categories and technical classes of roads. Traffic characteristics. Assignment of capacity and condition of traffic.Basic elements of highways. Definitions of urban and rural areas.Types of pavements. Basic of earthworks. Choice between options for a road schemes. Determination of highway cross sections. |
| **Assessment methods** | Essay test and project work |
| **Recommended readings** | Highway Engineering. Blackwell. 2008.Highway Engineering Handbook. McGraw Hill. 2009.Manual for Streets. Thomas Telford. 2007. |
| **Additional information** | Further readingsThe Handbook of Highway Engineering. CRC. 2006. |

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| **Course title** | **Railway Engineering** |
| **Person responsible for the course** | Dr. Janusz Hołowaty | **E-mail address**  | Janusz.Holowaty@zut.edu.pl |
| **Course code** **(if applicable)** | B\_1A\_S\_DUL2 | **ECTS points** | 5 |
| **Type of course** | compulsory | **Level of course** | S1 |
| **Semester**  | winter / summer | **Language of instruction** | English |
| **Hours per week** | 4 (2L+2W) | **Hours per semester** | 60 (30L+30W) |
| **Teaching method** | Lecture and design exercise |
| **Objectives of the course** | Understanding of railways and their elements |
| **Entry requirements** | Engineering geology |
| **Course contents** | History of railways. Railways in Poland and over the world. Standard, broad and narrow gauges. Categories of railway lines. Railway industry overview. Elements of track. Standards for tracks. Soil and geotechnical problems. Subgrade and sub-ballast. Drainage. Basic of railway design. Communications and signals. Electrification.Railway structures. Speed rail. Railway maintenance. Determination of railway cross sections. |
| **Assessment methods** | Essay test and project work |
| **Recommended readings** | Practical Railway Engineering. Imperial Collage Press. 2010.Railway Engineering. Oxford University Press. 2010. |
| **Additional information** | Further readings1. Practical Guide to Railway Engineering. AREMA 2008.
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| **Course title** | **Roads, streets and junctions** |
| **Person responsible for the course** | Dr. Janusz Hołowaty | **E-mail address**  | Janusz.Holowaty@zut.edu.pl |
| **Course code** **(if applicable)** | B\_1A\_S\_DUL4+6+8 | **ECTS points** | 5 |
| **Type of course** | compulsory | **Level of course** | S1 |
| **Semester**  | winter / summer | **Language of instruction** | English |
| **Hours per week** | 5 (3L+2W) | **Hours per semester** | 75 (45L+30W) |
| **Teaching method** | Lecture and design exercise |
| **Objectives of the course** | Understanding elements of roads, streets and junction |
| **Entry requirements** | Highway engineering |
| **Course contents** | Criteria for roads and street design. Design vehicles. Driver performance. Traffic parameters. Levels of service and highway capacities. Pedestrian and bicycle facilities. Basic elements of highway design. Design speed, sight distances, horizontal and vertical alignment. Elements of cross section. Design of road and street elements. Local and collector roads and streets. Rural and urban arterials (expressways and motorways). Intersections: types, channelization and traffic signal control.  Grade separations and interchanges. Grade separation structures. Types of interchanges. Ramps. Airport pavements. |
| **Assessment methods** | Essay test and road project. |
| **Recommended readings** | Highway Engineering. Blackwell. 2008.Highway Engineering Handbook. McGraw Hill. 2009.Principles of Highway Engineering and Traffic Analysis. Wiley. 2005.Manual for Streets. Thomas Telford. 2007. |
| **Additional information** | Further readingsGeometric Design of Highways and Streets. AASHTO. 2004.Pedestrian Facilities. Thomas Telford. 2010.Planning & Design of Airports. MacGraw-Hill. 2010. |

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| **Course title** | **Building Physics II**  |
| **Teaching method** | Lecture and presentation-paper |
| **Person responsible for the course** | Karolina Kurtz-Orecka | **E-mail address to the person responsible for the course** | karolinakurtz@gmail.com kurtz@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/OiZ/63 | **ECTS points** | 3 |
| **Type of course** | Elective/ optional | **Level of course** | S1 |
| **Semester**  | winter/ summer | **Language of instruction** | English |
| **Hours per week** | 1L + 2W | **Hours per semester** | 15L + 30W |
| **Objectives of the course** | Skills of calculating building energy use for space heating, finding strategies for building shading in summer, elementary skills of room acoustics design |
| **Entry requirements** | Building Materials, Civil Engineering, optional - Building Installations |
| **Course contents** | Thermal environment – Thermal behavior of buildings, Thermal designs: passive controls (passive control of heat flow, control functions of design variables, climatic design archetypes, condensation and moisture control, microclimatic controls), Energy performance of buildings, Energy use for space heating and cooling, energy conservation, Light – the luminous environment: Physics of light (attributes of light, photometry, transmission of light), Daylight and sunlight (sky conditions, daylight illuminance, luminance distribution, overshadowing, control of sunlight), Sound – the sonic environment: Physics of sound (attributes and propagation of sound, acoustic quantities), Noise control (sound transition, control of environmental noise, barriers and sound insulation), Room acousticsIntegrated environmental design – energy conservation redesign project of buildings with determined energy characteristics: heat (energy) demand factor or energy class. |
| **Assessment methods** | Project work, grade |
| **Recommended readings** | The European Directive for the Energy Performance of Buildings Incopera F.P., DeWitt D.P., Bergman T.L., Lavine A.S. (2007) Fundamentals of Heat and Mass Transfer. Sixth Edition, John Wiley & Sons 2007McMullan R. (2006) Environmental Science in Building. Fifth edition. Palgrave MacMillan, New York Smith P.F. (2005) 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 – TokyoSzokolay S.V. (2007) Introduction to Architecture Science: The Basis of Sustainable Design. Elsevier Architectural Press, Amsterdam – Boston – Heidelberg – London – New York – Oxford – Paris – San Diego – San Francisco – Singapore – Sydney – TokyoEN ISO, EN, ISO Standards |
| **Additional information** |  |

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| **Course title** | **Design of Sustainability Buildings**  |
| **Teaching method** | Lecture and presentation-paper |
| **Person responsible for the course** | Karolina Kurtz-Orecka | **E-mail address to the person responsible for the course** | karolinakurtz@gmail.com kurtz@zut.edu.pl |
| **Course code** **(if applicable)** |  | **ECTS points** | 3 |
| **Type of course** | Optional | **Level of course** | S1 |
| **Semester**  | winter/summer | **Language of instruction** | English |
| **Hours per week** | 1L + 2W | **Hours per semester** | 15L + 30W |
| **Objectives of the course** | Skills of finding insulation choices and strategies for different types of buildings and design low energy residential buildings. |
| **Entry requirements** | Building Materials, Civil Engineering, optional - Building Installations |
| **Course contents** | 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** | Project work, grade |
| **Recommended readings** | * Edwards B. (2010) Rough Guide to Sustainability. 3rd Edition. RIBA Pablishing, London
* Guzowski M. (2010) Towards Zero-energy Architecture. New Solar Design. Laurence King Publishing, London
* Hegger M., Fuchs M., Stark T., Zeumer M. (2008) Energy Manual. Sustainable Architecture. Edition Detail. Birkhäuser, Basel, Boston, Berlin
* Jonstone D., Gibson S. (2010) Toward a Zero Energy Home. A complete Guide to Energy Self-Sufficiency at Home. The Taunton Press, Newtown
* McMullan R.: Environmental Science in Building. Fifth edition. Palgrave MacMillan, New York 2006
* Roaf S., Fuentes M, Thomas S. (2007) Ecohouse. A Design Guide. Third edition. Elsevier Architectural Press, Amsterdam – Boston – Heidelberg – London – New York – Oxford – Paris – San Diego – San Francisco – Singapore – Sydney – Tokyo
* Smith P.F. (2005) 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
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| **Additional information** |  |

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| **Course title** | **Fundamentals of Earth** **Science** |
| **Person responsible for the course** | dr.Leszek Kaszubowski | **E-mail address to the person responsible for the course** | kaszubowski@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/IŚ/S1/B14 | **ECTS points** | 3 |
| **Type of course** | obligatory | **Level of course** | S1 |
| **Semester**  | winter | **Language of instruction** | English |
| **Hours per week** | 2 | **Hours per semester** | 30 |
| **Teaching method** | Lectures and Projects |
| **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** | - |
| **Course contents** | Lecture: 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.Project: 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. |
| **Assessment methods** | Project work, continuous assessment, presentation, tests |
| **Recommended readings** | * Keller E.A.: Environmental Geology. 8th Edition Prentice Hall, NJ,2000
* Legget R. F., Hatheway A. W.: Geology and Engineering. McGraw-Hill Book Company, 3rd Edition, NY, 1988
* McLean A.C., Gribble C.D.: Geology for Civil Engineers. George Allen &Unwin, London-Boston-Sydney, 1979
* Spencer E.W.: Introduction to the structure of the earth. McGraw-Hill Book Company, 3rd Edition, NY, 1988
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| **Additional information** |  |

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| **Course title** | **HYDROGEOLOGY** |
| **Person responsible for the course** | dr.Leszek Kaszubowski | **E-mail address to the person responsible for the course** | kaszubowski@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/OiZ/-/51 | **ECTS points** | 3 |
| **Type of course** | Elective | **Level of course** | S1 |
| **Semester**  | Winter | **Language of instruction** | English |
| **Hours per week** | 2 | **Hours per semester** | 30 |
| **Teaching method** | Lectures and Projects |
| **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** | Engineering geology |
| **Course contents** | Lecture: 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.Project: 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. |
| **Assessment methods** | Project work, continuous assessment, presentation |
| **Recommended readings** | * Cashman P.M., Preene M.: Groundwater Lowering in Construction. A Practical Guide. Spon Press. London, 2001
* Davis S.N. and DeWiest R.J.M.: Hydrogeology. Krieger Publishing Company, Florida, 1991
* Keller E.A.: Environmental Geology. 8th Edition Prentice Hall, NJ,2000
* Legget R. F., Hatheway A. W.: Geology and Engineering. McGraw-Hill Book Company, 3rd Edition, NY, 1988
* Hiscock K.M.: Hydrogeology principles and practice. Blackwell Publishing, 2005. Knovel Release Date: 07.01.2007
* Weight W. D.: Hydrogeology Field Manual (2nd Edition). McGraw Hill, 2008. Knovel Release Date: 11.10.2010
 |
| **Additional information** | The students of ECEM make choice between Environmental Geotechnology and Hydrogeology |

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| **Course title (nazwa przedmiotu)** | **Heat sources** |
| **Teaching method** | Lecture, Project |
| **Person responsible for the course** | Dorota Leciej-Pirczewska | **E-mail address to the person responsible for the course** | dlp@zut.edu.pl |
| **Course code** **(if applicable)** |  | **ECTS points** | 5 |
| **Type of course** | optional | **Level of course** | S1 |
| **Semester**  | winter  | **Language of instruction** | English |
| **Hours per week** | L-2, P-2 | **Hours per semester** | L-30, P-30 |
| **Objectives of the course** |  |
| **Entry requirements** | Thermodynamics, Fluid Mechanics |
| **Course contents** | Lecture: 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.Project: Project of central heating station |
| **Assessment methods** | Grade, project work |
| **Recommended readings** | Principles of Plate Heat Transfer in Paraflows APV Baker AS, 1980Kreider J.F.: Handbook of Heating, Ventilation and Air Conditioning. CRC Press LLC 2001 |
| **Additional information** |  |

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| **Course title** | **Contract Procedures** |
| **Teaching method** | lecture / workshop |
| **Person responsible for the course** | mgr inż. K.Tracz | **E-mail address to the person responsible for the course** | ktracz@zut.edu.pl |
| **Course code** **(if applicable)** | BIE\_1A\_S/PO3/6 | **ECTS points** | 5 |
| **Type of course** | optional | **Level of course** | S1 |
| **Semester**  | WINTER | **Language of instruction** | English |
| **Hours per week** | 2 | **Hours per semester** | 30 |
| **Objectives of the course** | Basic knowledge of of construction works contracting. |
| **Entry requirements** | the acquaintance of bases of the economy, and also: technologies and building′s materials , bases of the general building |
| **Course contents** | Basic definitions of the contract, specifics of construction contracting in respect to private and public sector, types of construction contracts by private employers, optimization of contract risks in selection of contract type, the principles of contract negotiations, basics of tender specification for private contracts – SIWZ elements, selection procedure of the best tender.  |
| **Assessment methods** | project work and written exam |
| **Recommended readings** | 1. Seeley Ivor, Quantity surveying practice, MacMillan Education Ltd. 1991,
2. Jenkins Robert, Construction contracts, 1998
3. JCT works-1998
4. Will Hughes , Construction Contracts Law and Managemens, Spon 2000
 |
| **Additional information** | **-** |

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| **Course title** | **Quality Management Systems** |
| **Teaching method** | lecture / workshop |
| **Person responsible for the course** | mgr inż. Krzysztof Tracz | **E-mail address to the person responsible for the course** | **ktracz@zut.edu.pl** |
| **Course code** **(if applicable)** | BIE\_1A\_S/PO3/7 | **ECTS points** | **5** |
| **Type of course** | optional | **Level of course** | **S1** |
| **Semester**  | WINTER | **Language of instruction** | **English** |
| **Hours per week** | 2 –lecture,2 -workshop | **Hours per semester** | **30 – lecture,** **30 - workshop** |
| **Objectives of the course** | History and evolution of quality idea, the scope and basics of description of quality norms, the basic meanings and structure of norms series ISO 9000, process approach and its interpretation for construction companies, basic tools of quality management – Fishbone diagram, Pareto Analysis, TQM, quality costs, documentation structure of QMS, the requirements of norm ISO 9001: 2000 in respect to construction activities, |
| **Entry requirements** |  Basic knowledge of construction works technology. |
| **Course contents** | - working out of Quality Policy for construction company,- working out of Quality Planu for indicated construction work - working out of Quality Procedure for indicated clouse of the norm ISO 9001, |
| **Assessment methods** | Continuous assessment |
| **Recommended readings** | 1.Normy ISO 9000, 9001: 2000, 90042.Wawak Sławomir, Zarządzanie jakościa – teoria I praktyka, hellion, 20023.Flood Robert L., Beyond TQM, John Wiley & Sons, 19944.Georg Stephen, Weimerskirch Arnold, Total Quality Management, John Wiley & Sons, 1994 |
| **Additional information** | - |

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| **Course title** | **Project Management** |
| **Teaching method** | lecture / workshop |
| **Person responsible for the course** | mgr inż Krzysztof Tracz | **E-mail address to the person responsible for the course** | ktracz@zut.edu.pl |
| **Course code** **(if applicable)** | BIE\_1A\_S/C21 | **ECTS points** | 4 |
| **Type of course** | Compulsory | **Level of course** | S1 |
| **Semester**  | WINTER | **Language of instruction** | English |
| **Hours per week** | 2 | **Hours per semester** | 30 |
| **Objectives of the course** | Basic knowledge of Project analysis and making investment decision. Planning at early stage of investment strategy. Building of Project team. Identification of Works packages. |
| **Entry requirements** | the acquaintance of bases of the economy, and also: technologies and building′s materials , bases of the general building |
| **Course contents** | Project definition, Project life cycle, Project management elements, Project selection model, Project management methodologies (classic, PMBOK, PRINCE 2), SWOT analysis, Basic elements of strategy planning, portfolio management, process integration, Basic duties of Project manager, work breakdown structure (WBS). Case study: SWOT analysis, selection of the model, strategy of project. |
| **Assessment methods** | project work and written exam |
| **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
4. Kerzner Harold "Advanced Project Management – edycja polska- John Wiley &Sons, 2004
5. Code of Practice for Projekt Management for Construction and Development, 3 Edition, 2008
 |
| **Additional information** | **-** |

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| **Course title** | **THEORETICAL MECHANICS** |
| **Teaching method** | lecture / workshop |
| **Person responsible for the course** | Małgorzata Abramowicz | **E-mail address to the person responsible for the course** | mabramowicz@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/OiZ/-/18 | **ECTS points** | 4 |
| **Type of course** | Obligatory | **Level of course** | S1 |
| **Semester**  | Winter | **Language of instruction** | English |
| **Hours per week** | 3 (L-1, P-2) | **Hours per semester** | 45 (L-15, P-30) |
| **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** | Knowledge of mathematics and 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. Progressive movement. The rotary motion relative to a fixed axis. Plane motion of the mass. Motion absolute, relative motion and drift motion and their velocity and acceleration. Acceleration of Coriolis. Study the possibility of movement. The concept of geometric invariance of the system. Plan poles. Determination of the instantaneous rotation angle - the equation of the kinematic chain. Dynamics of material point and the material system. Differential equations of motion. Free movement of damping. Harmonically forced oscillation of a simple example. The phenomenon of resonance. Possible and the virtual displacement. The principle of virtual work. Rule d'Alembert.  |
| **Assessment methods** | project work and 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. Classical Mechanics, John R. Taylor, University Science Books, 2005,
5. Spacetime Physics, Edwin F. Taylor and John Wheeler, W. H. Freeman and Co., 1966.
 |
| **Additional information** |  |

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| **Course title** | **BASIC STEEL STRUCTURES** |
| **Teaching method** | lecture / workshop |
| **Person responsible for the course** | Małgorzata Abramowicz | **E-mail address to the person responsible for the course** | mabramowicz@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/OiZ/-/34 | **ECTS points** | 6 |
| **Type of course** | obligatory | **Level of course** | S1 |
| **Semester**  | winter | **Language of instruction** | English |
| **Hours per week** | 5 (L-3, P-2) | **Hours per semester** | 75 (L-45, P-30) |
| **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.Basic steel structural engineering |
| **Entry requirements** | Load estimation skills and structural analysis capability, particularly shear and moment diagrams obtained from static analysis under the appropriate loads. |
| **Course contents** | This course covers the following topics: This course is designed to 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 will be discussed. Students are expected to obtain basic knowledge about the design and failure mode of steel structural members after finished this course.Upon completion of this course, students should be able to:recognize the design philosophy of steel structures and have concept on limit state design,understand the behaviour of steel structures, in particular the various forms of failure for members and connections under tension, compression, bending and combined actions,apply the principles, procedures and current code requirements to the analysis and design of steel tension members, beams, columns, beam-columns and connections. |
| **Assessment methods** | Mark for the design and written exam |
| **Recommended readings** | 1. Lam, D., Ang, T-C. and Chiew, S-P, Structural Steelwork: Design to Limit State Theory, 3rd Edition, Butterworth-Heinemann Ltd.
2. Morris, L. J. & Plum, D. R., Structural Steelwork Design to BS 5950, 2nd Edition, Prentice Hall.
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
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| **Additional information** |  |

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| **Course title** | **Renewable Energy Resources (RENER)** |
| **Teaching method** | Lecture, problem solving sessions, technical excursion, homework -a “portfolio” of information on a renewable energy topic/technology will be developed by each student. |
| **Person responsible for the course** | Ewa Figiel PhD Eng | **E-mail address to the person responsible for the course** | figiel@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/BE/-/40 | **ECTS points** | 3 |
| **Type of course** | A mix of formal lectures, tutorials plus free study time | **Level of course** | Bachelor (BSc) |
| **Semester**  | VI- winter | **Language of instruction** | English or German |
| **Hours per week** | Lecture 1 hour per weekWorkshop 1 hour per week | **Hours per semester** | Lecture 15 hoursWorkshop 15 hours |
| **Objectives of the course** | At the successful completion of RENER, the student is expected to have/be able to: 1.List and generally explain the main sources of energy and their primary applications in the EU, and the world. 2.Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the environment. 3.Discuss remedies/potential solutions to the supply and environmental issues associated with fossil fuels and other energy resources. 4.List and describe the primary renewable energy resources and technologies. 5.Describe/illustrate basic electrical concepts and system components. 6.Convert units of energy—to quantify energy demands and make comparisons among energy uses, resources, and technologies. 7.Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.  |
| **Entry requirements** | A good degree in Mathematics or Physics (preferably) |
| **Course contents** | Introduction to energy systems and resources .Energy, sustainability & the environment.Quantifying energy & energy arithmetic Heat to motive powerFossil fuels -past, present & future.Remedies & alternatives for fossil fuels.CHP/cogeneration. Energy efficiency and conservation.Solar –thermal Solar -PVWind –small & large. Hydro –small & large. Wave & tidal. Geothermal.Sizing residential systems.Biomass & Biofuels overview.Biogas.Woody biomass.Liquid biofuels.Heat pumps.Fuel cells.Sizing residential systems.Student portfolio presentation. |
| **Assessment methods** | Grade Method: Many lecture periods will have a graded componentor exercise. These may be written assignments, in-class assignments, homework, or the evaluation of the student's participation and attitude. Each student will conduct a project addressing a renewable energy resource/topic by researching, developing, and preparing a renewable energy resource portfolio. Topics must be approved by theinstructor. Final projects will be presented in class (oral presentation), |
| **Recommended readings** | Kemp, The Renewable Energy Handbook. Aztext Press 2009 ISBN: 0973323329Sorensen , RENEWABLE ENERGY 3E, ISBN 13:9780126561531DA ROSA, FUNDAMENTALS OF RENEWABLE ENERGY, ISBN 13:9780120885107Markvart, PRACTICAL HANDBOOK OF PHOTOVOLTAICS, ISBN 13:9781856173902Markvart, SOLAR CELLS, ISBN 13: 9781856174572 Gupta, Geothermal Energy, ISBN 13: 9780444528759Silveira, Bioenergy - Realizing the Potential, ISBN13 : 9780080446615OrRenewable Energy ebook Collection. Ultimate CD |
| **Additional information** | Max. 3 persons in group |

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| **Course title** | **Project Management** |
| **Teaching method** | lecture / workshop |
| **Person responsible for the course** | mgr inż. Krzysztof Tracz | **E-mail address to the person responsible for the course** | ktracz@zut.edu.pl |
| **Course code** **(if applicable)** | BIE\_1A\_S/C21 | **ECTS points** | 6 |
| **Type of course** | compulsory | **Level of course** | S1 |
| **Semester**  | SUMMER | **Language of instruction** | English |
| **Hours per week** | 2 | **Hours per semester** | 30 |
| **Objectives of the course** | Basic methods of planning and control of construction project management during early stage and execution of the works.  |
| **Entry requirements** | Economics of Enterprises (compulsory course), Project Managementof V sem., basics of construction technology  |
| **Course contents** | Life cycle of investment process – efficiency analysis and planning of Project, preliminary project frames, monitoring and control of construction project, scope management, Cost management and reporting, analysis of scope changes in respect to Project outcomes, progress reports, *Earned Value* method of monitoring, implementation and control of communication system in investment process, basic tools of quality management during construction process– *Method Statement, Quality Plan, Non conformance report.* Case studies: preliminary budget and efficiency calculation, cash-flow of the construction project, calculation of earned value of project, correction methods to budget and project delays, examples of reports and MOMs |
| **Assessment methods** | project work and 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
4. Code of Practice for Projekt Management for Construction and Development, 3 Edition, 2008
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| **Additional information** | **-** |

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| **Course title** | **Technology of special hydrotechnical works** |
| **Teaching method** | Lecture/workshop |
| **Person responsible for the course** | Jacek Kurnatowski, Ph.D. | **E-mail address to the person responsible for the course** | jkurnatowski@zut.edu.pl |
| **Course code** **(if applicable)** | S1/OiZ/-/60 | **ECTS points** | 3,0 |
| **Type of course** | Elective | **Level of course** | S1 |
| **Semester**  | Summer | **Language of instruction** | English |
| **Hours per week** | 1L/1W | **Hours per semester** | 15L/15W |
| **Objectives of the course** | To provide basic knowledge on flood protection works with special regard to dikes construction. |
| **Entry requirements** | Hydraulics & Hydrology, Hydrotechnics |
| **Course contents** | Lectures: Active and passive flood protection. Technical and non-technical measures for flood protection. Probability of flows, classification of flood protection dikes. Filtration throughout dikes, methods of its reduction, drainage. Principles for dikes dimensioning. Dikes construction technologies. Dikes maintenance. Crisis management before, during and after the flood.Workshop: Project for a I0 class flood protection dike along a lowland river (approx. 2 km). |
| **Assessment methods** | Grade for lectures & project works |
| **Recommended readings** | 1. Jansen, P.P. Principles of River Engineering: The Non-Tidal Alluvial River. Pitman, 1979.
2. Pavel P. Canal and river levees. Elsevier, 1982.
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| **Additional information** |  |

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| **Course title** | **Technology of river regulation works** |
| Teaching method | Lecture/workshop |
| Person responsible for the course | Jacek Kurnatowski, Ph.D. | E-mail address to the person responsible for the course | jkurnatowski@zut.edu.pl |
| Course code (if applicable) | S1/OiZ/-/59 | ECTS points | 3,0 |
| Type of course | Elective | Level of course | S1 |
| Semester  | Summer | Language of instruction | English |
| Hours per week | 1L/1W | Hours per semester | 15L/15W |
| Objectives of the course | To provide basic knowledge on river training works with special regard to modern approach. |
| Entry requirements | Hydraulics & Hydrology, Hydrotechnics |
| Course contents | Lectures: Aims and basic principles of river training works. Horizontal watercourse pattern, curvature, bending, river dynamics features. Principles of Farque and Girardon. Determination of regulation route, variability of curvature radiuses. Lowland rivers regulation systems, types of regulation constructions, localization principles. Materials and elements applied in river training field works. Regulation constructions performance. Special cases of lowland rivers regulation. Ecological aspects of river training works.Workshop: Lowland river regulation project for a river stretch (approx. 2 km). |
| Assessment methods | Grade for lectures & project works |
| Recommended readings | 1. Jansen, P.P. Principles of River Engineering: The Non-Tidal Alluvial River. Pitman, 1979.
2. Bogardi, J. Sediment Transport in Alluvial Streams. Akademiai Kiado, Budapest, 1978.
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| Additional information |  |

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| **Course title** | **BUILDING INSTALLATIONS** |
| **Teaching method** | Lecture, workshop, practical design |
| **Person responsible for the course** | Katarzyna Zwarycz-Makles,PhD Eng | **E-mail address to the person responsible for the course** | kzwarycz@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/W/-/26 | **ECTS points** | 3 |
| **Type of course** | Obligatory | **Level of course** | S1 |
| **Semester**  | IV – summer | **Language of instruction** | English |
| **Hours per week** | Lecture (2hours/week), design exercises (1hour/week) | **Hours per semester** | lecture (15 hours)workshop (15 hours) |
| **Objectives of the course** | Understanding of the workings of building installation (water supply, sanitary, gas, central heating, hot tap water), performing of calculations and selection of typical basic installation equipment (pipes dimension, water meter, gas meter, boiler, radiators), making design drawings |
| **Entry requirements** | Ability to draw in AutoCad |
| **Course contents** | 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. Calculate the water and sewage installations, central heating and gas for single-family house. Determination of pipe diameters and water / wastewater. Calculation of heat transfer coefficient values, identify the need for central heating, the selection of radiators and heat sources. Implementation of plant expansions and projections. |
| **Assessment methods** | Grade, project work |
| **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, eg: http://www.standardsuk.com4. Producers catalogues and instructions of equipment |
| **Additional information** | Max. 3 persons in group |

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| **Course title** | **GEOENGINEERING** |
| **Person responsible for the course** | Andrzej Pozlewicz | **E-mail address to the person responsible for the course** | andpoz@zut.edu.pl |
| **Course code** **(if applicable)** | BIE\_1A\_S\_D17 | **ECTS points** | 3 |
| **Type of course** | Elective | **Level of course** | S1 |
| **Semester**  | Summer | **Language of instruction** | English |
| **Hours per week** | 2 | **Hours per semester** | 30 |
| **Teaching method** | Lecture (1 hour/week), project (1 hour/week) |
| **Objectives of the course** | Create an ability to use appropriate modification methods for subsoil modification with respect to various geological and load conditions |
| **Entry requirements** | Soil mechanics, geology, foundation design |
| **Course contents** | Soil improvement technologies, purpose and methods for different soil and water conditions, methods of modification of subsoil, soil densification, shallow and deep soil exchange, soils consolidation methods, major problems in compacted fill technology, fills and fill compaction, soil reinforcement technologies, anchoring systems technology, sheet piling technology, grouting technology, groundwater lowering in construction, slurry walls technology, slope stability improvement methods |
| **Assessment methods** | Project work, continuous assessment, presentation |
| **Recommended readings** | * Bowles, J.E.: Foundation Analysis and Design (5th Edition). McGraw-Hill , 1996. Knovel Release Date: 2007-01-02
* Cashman P.M., Preene M.: Groundwater Lowering in Construction. A Practical Guide. Spon Press., London, 2001
* Cernica J.: Geotechnical Engineering – Foundation Design. Wiley & Sons, 1995
* Day R.W.: Foundation Engineering Handbook – Design and Construction with the 2006 International Building Code. McGraw-Hill, 2006, Knovel Release Date: 2006-08-09
* Eurocode 7
* Monahan E.J.: Construction of Fills (2nd Edition). John Wiley and Sons. 1994. Knovel Release Date: 2007-08-22
* Peck R.B., Hanson W.E., Thornburn T.H.: Foundation Engineering (2nd Edition). John Wiley & Sons. 1974. Knovel Release Date: 2007-08-22
* Reese L.C., Isenhower W.M., Wang Shin-Tower: Analysis and Design of Shallow and Deep Foundations. John Wiley and Sons. 2006. Knovel Release Date: 2007-08-22

Simons N., Menzis B.: A Short Course in Foundation Engineering. Thomas Telford, London, 2000 |
| **Additional information** | The students of ECEM make choice between Technology of Foundation Works and Geoengineering |

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| **Course title** | **TECHNOLOGY OF FOUNDATION WORKS** |
| **Person responsible for the course** | Andrzej Pozlewicz | **E-mail address to the person responsible for the course** | andpoz@zut.edu.pl |
| **Course code** **(if applicable)** | BIE\_1A\_S\_D16 | **ECTS points** | 3 |
| **Type of course** | Elective | **Level of course** | S1 |
| **Semester**  | Summer | **Language of instruction** | English |
| **Hours per week** | 2 | **Hours per semester** | 30 |
| **Teaching method** | Lecture (1 hour/week), project (1 hour/week) |
| **Objectives of the course** | Create an ability to recognize technological problems connected to construction of foundations and excavation support |
| **Entry requirements** | Soil mechanics, geology, foundation design |
| **Course contents** | Spread foundation technology, raft foundations, deep shaft foundations, foundations construction, site preparation, excavation methods, trench excavation, support of excavations, anchoring systems technology, sheet piling technology, grouting technology, groundwater lowering in construction, slurry walls technology |
| **Assessment methods** | Project work, continuous assessment, presentation |
| **Recommended readings** | * Bowles, J.E.: Foundation Analysis and Design (5th Edition). McGraw-Hill , 1996. Knovel Release Date: 2007-01-02
* Cashman P.M., Preene M.: Groundwater Lowering in Construction. A Practical Guide. Spon Press., London, 2001
* Cernica J.: Geotechnical Engineering – Foundation Design. Wiley & Sons, 1995
* Day R.W.: Foundation Engineering Handbook – Design and Construction with the 2006 International Building Code. McGraw-Hill, 2006, Knovel Release Date: 2006-08-09
* Eurocode 7
* Peck R.B., Hanson W.E., Thornburn T.H.: Foundation Engineering (2nd Edition). John Wiley & Sons. 1974. Knovel Release Date: 2007-08-22
* Reese L.C., Isenhower W.M., Wang Shin-Tower: Analysis and Design of Shallow and Deep Foundations. John Wiley and Sons. 2006. Knovel Release Date: 2007-08-22
* Simons N., Menzis B.: A Short Course in Foundation Engineering. Thomas Telford, London, 2000
* Tomlinson M.J.: Foundation Design and Construction. Prentice Hall, Harlow, 7th Edition, 2001
 |
| **Additional information** | The students of ECEM make choice between Technology of Foundation Works and Geoengineering |

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| **Course title** | **NEW GENERATION OF CONCRETE** |
| **Teaching method** | Lecturer, Laboratory |
| **Person responsible for the course** | Maria Kaszynska | **E-mail address to the person responsible for the course** | mkasz@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/OiZ/-/52 | **ECTS points** | 3 |
| **Type of course** | Elective | **Level of course** | S1 |
| **Semester**  | Summer | **Language of instruction** | English  |
| **Hours per week** | 2 | **Hours per semester** | 30 |
| **Objectives of the course** | Practical skill to design composition of new generation of concrete and technology of application. |
| **Entry requirements** | Building Materials |
| **Course contents** |

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| High-performance concrete principles, Properties of high-performance concreteEffect of mineral additions and chemical admixtures on concrete propertiesSelf-compacting concrete, Lightweight high-performance concreteFibre-reinforced-high-performance concrete, Ultra high-strength cement-based materials |

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| **Assessment methods** | Continuous assessment |
| **Recommended readings** | Aitcin P.C. High-Performance Concrete. E&FN SPON 1998. Nevill A.N. Properties of concrete,2002Mindess Sidney, Young J. Francis, Darwin David – Concrete, 2003 |
| **Additional information** |  |

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| **Course title** | **Basic Concrete Structures** |
| **Teaching method** | lecture and design workshop |
| **Person responsible for the course** | mgr inż. Piotr Brzozowski | **E-mail address**  | piotr.brzozowski@zut.edu.pl |
| **Course code** **(if applicable)** | B/S1/29 | **ECTS points** | 5 |
| **Type of course** | Compulsory | **Level of course** | S1 |
| **Semester**  | winter / summer | **Language of instruction** | English |
| **Hours per week** | 4 (2L+2W) | **Hours per semester** | 60 (30L+30W) |
| **Objectives of the course** | Basic knowledge of concrete structural engineering |
| **Entry requirements** | Strength of materials |
| **Course contents** | History of concrete structures. Standards and codes for concrete structures. Proprieties of concrete, reinforcement and prestressing steel.Basic of structural design of reinforced concrete ( beams, slabs and columns).Basic of prestressed concrete.Fundamentals of bending, shear and compression. Detailing of reinforced concrete members. Design of reinforced concrete slab, beams and column. |
| **Assessment methods** | Essay test, project works and continuous assessment |
| **Recommended readings** | Design of Structural Elements. Spon. 2009.Structural Elements Design Manual. Elsevier. 2009.Reinforced Concrete Design. Palgrave. 1999. |
| **Additional information** | Further readingsFundamentals of prestressed concrete design. PCI. 1991. |

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| **Course title** | **TECHNOLOGY OF STEEL STRUCTURES**  |
| **Teaching method** | Lecture and tutorials |
| **Person responsible for the course** | Dr Wiesław Paczkowski | E-mail address to the person responsible for the course | wespa@ps.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/OiZ/-/55 | ECTS points | 3 |
| **Type of course** | Elective (by the end of December) | Level of course | S1 |
| **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 storage tank for petroleum industry. |
| **Entry requirements** | Good knowledge of strength of materials, structural mechanics and rules of design of steelwork. |
| **Course contents** | Introduction to steel’s role in construction industry: mild steel as a backbone of theindustry, the world steel production, costs of construction works and steelwork costs,European system of steel grades notation. Steel storage tanks: classification, roofs, basic, rules of shell design, bottom 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.Design of a vertical cylindrical steel welded storage tank in compliance with PN – B –03210:1997 or Eurocode 3. |
| **Assessment methods** | Students receive final mark for the quality of a design of the tank. The work is done in 3 person groups. |
| **Recommended readings** | 1) Ziółko J.: Zbiorniki metalowe na ciecze i gazy. Arkady, Warszawa 1986.2) PN-B-03210:1997. Konstrukcje stalowe. Zbiorniki walcowe pionowe na ciecze.Projektowanie i wykonanie.3) Eurocode 0 – Basis of structural design.4) Eurocode 1 – Actions on structures.5) Eurocode 3 – Design of steel structures.6) BS 2654:1989 Manufacture of vertical steel welded non-refrigerated storage tanks with butt - welded shells for the petroleum industry.7) Owens G. W., Knowles P.R., Dowling P.J.: Steel Designers' Manual, BlackwellScientific Publications, Cambridge, 2003.8) Dowling P.J., Knowles P.R., Owens G.W.: Structural Steel Design, Butterworths,London, 1988. |
| **Additional information** |  |

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| **Course title** | **INDUSTRIAL STEEL STRUCTURES**  |
| **Teaching method** | Lecture and tutorials |
| **Person responsible for the course** | Dr Wiesław Paczkowski | **E-mail address to the person responsible for the course** | wespa@ps.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/OiZ/-/56 | **ECTS points** | 3 |
| **Type of course** | Elective (by the end of December) | **Level of course** | S1 |
| **Semester**  | Summer | **Language of instruction** | English |
| **Hours per week** | 2 | **Hours per semester** | 30 |
| **Objectives of the course** | Knowledge of the manufacture technology of a complex structural steelwork. Practicalskill to design an industrial hall including all main parts which constitute the overallstructure. |
| **Entry requirements** | Good knowledge of strength of materials, structural mechanics and rules of design of steelwork. |
| **Course contents** | Historical development and modern usage of steel for selected types of structures. Process of design: developing a structural system. Design of industrial buildings: categories, selection process of framing systems, loads imposed on the structure, transport system, general arrangement of typical industrial building. Gantry girders. Telpher beams. Trestle bridges. Steel storage tanks. Industrial chimneys.Design of a simple workshop: selection of a form of structure including bracing system, choice of cladding, design of steelwork, roof truss design, design of truss members on the basis of Eurocode 3. |
| **Assessment methods** | Students receive final mark for the quality of a design of the industrial hall. The work is done in 3 person teams. |
| **Recommended readings** | 1) Owens G. W., Knowles P.R., Dowling P.J.: Steel Designers' Manual, BlackwellScientific Publications, Cambridge, 2003.2) Morris L. J., Plum D. R.: Structural Steelwork Design to BS 5950. LongmanScientific&Technical, Harlow, 1989.3) BS 5950 Structural use of steelwork in building4) Bates W.: Design of structural steelwork. Workshop with EOT crane. Constrado,Croydon 1997.5) Eurocode 0 – Basis of structural design.6) Eurocode 1 – Actions on structures.7) Eurocode 3 – Design of steel structures.8) Dowling P.J., Knowles P.R., Owens G.W.: Structural Steel Design, Butterworths,London, 1988. |
| **Additional information** |  |

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| **Course title** | **TRANSPORTATION PLANNING IN URBAN AREAS** |
| **Person responsible for the course** | Jacek Czarnecki, PhD Eng | E-mail address to the person responsible for the course | jacek.czarnecki@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/DUL/47 | ECTS points | 5 |
| **Type of course** | Obligatory | Level of course | S1 |
| **Semester**  | 6 (summer) | Language of instruction | English |
| **Hours per week** | lecture - 2 hoursproject - 2 hoursworkshop - 1 hour | Hours per semester | lecture - 30 hoursproject - 30 hoursworkshop - 15 hour |
| **Teaching method** | Lecture, workshop, practical design |
| **Objectives of the course** | Understanding the principles of design of streets and intersections. |
| **Entry requirements** | Basic civil engineering knowledge. Basic drawing skills in Cad software. |
| **Course contents** | Basic definitions and parameters regarding roads, streets and intersections. Types of intersections. Guidelines of urban intersections design. Footways, pedestrian crossings, cycle paths, bus and parking bays. Traffic calming.Project of urban intersection made with use of CAD software. |
| **Assessment methods** | Written exam and project work. |
| **Recommended readings** | 1. A Policy on Geometric Design of Highways and Streets, AASHTO, 2004.2. The Civil Engineering Handbook, CRC Press, 2003. |
| **Additional information** | Maximum 15 students per group. |

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| **Course title** | **STRUCTURAL MECHANICS** |
| **Teaching method** | lecture / workshop |
| **Person responsible for the course** | Małgorzata Abramowicz | **E-mail address to the person responsible for the course** | mabramowicz@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/OiZ/-/31 | **ECTS points** | 4 |
| **Type of course** | Obligatory | **Level of course** | S1 |
| **Semester**  | Summer | **Language of instruction** | English |
| **Hours per week** | 4 (L-2, P-2) | **Hours per semester** | 60 (L-30, P-30) |
| **Objectives of the course** | To learn fundamentals of deformable bodies mechanics: stress, strain, material behavior as an introduction to structural analysis and design for static loads. Presenting concepts of statical structural analysis: equilibrium conditions, stress-strain relation (Hooke’s law) and structure deformation.  |
| **Entry requirements** | Knowledge of mathematics and physics and theoretical mechanics. |
| **Course contents** | Introduction to structural analysis. Statically determinate structures. Influence lines and moving loads. Displacements in statically determinate structures. Introduction to statically indeterminate structures. Virtual work. Displacement methods: simple structure, fundamental equation of displacement method, verification of results, statically indeterminate beams, framers, arches and trusses. Influence lines in statically indeterminate structures. Stiffness method: derivation of element stiffness matrices, assembly procedures, fundamental equation. Verification of results. |
| **Assessment methods** | tests, project work and written exam |
| **Recommended readings** | Roy Craig Jr. “Mechanics of Materials” John Hearn “Mechanics of Structures”Keith D. Hielmstad “Fundamentals of Structural Mechanics”Roy R. Craig “Fundamentals of Structural Dynamics” |
| **Additional information** |  |

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| **Course title** | **STRENGTH OF MATERIALS** |
| **Teaching method** | lecture / workshop |
| **Person responsible for the course** | Małgorzata Abramowicz | **E-mail address to the person responsible for the course** | mabramowicz@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/OiZ/-/26 | **ECTS points** | 5 |
| **Type of course** | Obligatory | **Level of course** | S1 |
| **Semester**  | Summer | **Language of instruction** | English |
| **Hours per week** | 5 (L-3, P-2) | **Hours per semester** | 75 (L-45, P-30) |
| **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, twisting bars or combinations of both. Effect of component dimensions and shape on stresses and deformations are to be understood. The study would provide knowledge for use in the design courses. |
| **Entry requirements** | Knowledge of mathematics and physics and theoretical mechanics. |
| **Course contents** | Introductory remarks. The types of building structures, loads and deformations.The basic assumptions of statics and strength of materials. Internal or external forces. Flat statically determinate rod systems. Cutting forces. Depending on the differential between the forces cross-cutting. Determination of cutting forces in beams of simple, broken and curved, in continuous beams, frames. Geometric characteristics of the shapes - the centers of gravity, moments of inertia. Stress, strain, Hooke's law, the basic material constants. Extension (compression) axis. Stresses in the cross diagonal. Flat stress state. Technical Shear. Bending simple. Bending with transverse forces. Oblique bending, bending in two planes. Tensile (compressive) eccentric. Torsion bars with circular cross-symmetric. Deflection of beams - Euler's method (method of Clebsch). Elastic energy. The stability of a straight bar. Bending with compression. Inelastic material properties, plasticity. bearing capacity cross border rod and rod systems. Elements of mechanics of thin-walled bars. |
| **Assessment methods** | project work and written exam |
| **Recommended readings** | Popov E.P, “Engineering Mechanics of Solids”, Prentice-Hall of India, New Delhi, 1997,Beer F. P. and Johnston R, “Mechanics of Materials”, McGraw-Hill Book Co, Third Edition, 2002,Nash W.A, “Theory and problems in Strength of Materials”, Schaum Outline Series, McGraw-Hill Book Co, New York, 1995,Kazimi S.M.A, “Solid Mechanics”, Tata McGraw-Hill Publishing Co, New Delhi, 1981,Ray Hulse, Keith Sherwin & Jack Cain, “Solid Mechanics”, Palgrave ANE Books, 2004,Singh D.K “Mechanics of Solids” Pearson Education 2002,Timoshenko S.P, “Elements of Strength of Materials”, Tata McGraw-Hill, New Delhi 1997. |
| **Additional information** |  |

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| **Course title** | **Construction Technology** |
| **Person responsible for the course** | Mgr inż. Patryk Wolert | **E-mail address**  | patryk.wolert@zut.edu.pl |
| **Course code** **(if applicable)** | B\_1A\_S\_C13+7 | **ECTS points** | 2 |
| **Type of course** | Compulsory | **Level of course** | S1 |
| **Semester**  | winter / summer | **Language of instruction** | English |
| **Hours per week** | 2 (1L+1W) | **Hours per semester** | 30 (15L+15W) |
| **Teaching method** | Lecture and design exercise |
| **Objectives of the course** | Understanding principles of construction technology |
| **Entry requirements** | Building materials |
| **Course contents** | Introduction to construction technology. Establishing the site. Site layout.Materials management. Demolition and excavation.Foundation and piling. Types of foundation. Ground treatment.Earth support and basement. Groundwater control.Concrete construction. Method of concrete placement. Building and roof frames in masonry, timber, glulam, concrete and steel.Formwork in construction. Floor construction. Cladding buildings. Domestic housing construction.Design of floor slab pour. |
| **Assessment methods** | Continuous assessment and design exercise |
| **Recommended readings** | Construction Practice. Wiley-Blackwell. 2011.Fundamental Building Technology. Routledge. 2013.Construction Technology: an Illustrated introduction. Blackwell Publ. 2005.Details for conventional wood frame construction. American Forest & Paper Association. 2001.  |
| **Additional information** | Further readings1. Pile Design and Construction Practice. E&FN Spon. 1997.2. Concrete Construction Engineering Handbook. CRC. 2008.3. Concrete Formwork Systems. Marcel Dekker Inc. 1999.4. Pavement Engineering. Principles and Practise. CRC. 2009.5. Building structures. John Wiley & Sons, Inc. 2012. |

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| **Course title** | **Elementary Structural Analysis** |
| **Person responsible for the course** | MSc. Hanna Weber | **E-mail address**  | Hanna.Weber@zut.edu.pl |
| **Course code** **(if applicable)** | B\_1A\_S\_C6+C11 | **ECTS points** | 3 |
| **Type of course** | Compulsory | **Level of course** | S1 |
| **Semester**  | winter / summer | **Language of instruction** | English |
| **Hours per week** | 2 (1L+1W) | **Hours per semester** | 30 (15L+15W) |
| **Teaching method** | Lecture and computational exercises |
| **Objectives of the course** | Basic structural analysis and understanding of structural elements |
| **Entry requirements** | Mathematics |
| **Course contents** | Aims of structural engineering. Theory of structures. Selection of structural materials. Design loads. Material and section properties. Elastic and plastic properties.Structural elements and their behaviour: beams, frames, trusses and arches.Statics of structures - reactions. Types of supports. Stability.Static indeterminacy.Internal forces.Bending, shear and combined stress. Analytical and computer methods in structural computations. |
| **Assessment methods** | Continuous assessment and computational exercises |
| **Recommended readings** | Fundamentals of Structural Analysis, fourth edition. McGraw-Hill. 2011Examples in structural analysis. Taylor&Francis. 2007.Basic Structures for Engineers and Architects. Blackwell. 2008.Understanding Structures. An Introduction to Structural Analysis. CRC. 2009.Introduction to Design for Civil Engineers. Spon. 2001. |
| **Additional information** | Further readingsStructures. From theory to practice. Spon. 2004.Basic Structural Behaviour. Understanding Structures from Models. Thomas Telford. 1993. |

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| **Course title** | **BASICS OF DESIGN OF WATER SUPPLY AND WASTE CONVEYANCE SYSTEMS** |
| **Person responsible for the course** | Dorota Stocka, M.A.Sc., P.Eng. | E-mail address to the person responsible for the course | Dorota.Stocka@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/W/-/31 | ECTS points | 2 |
| **Type of course** | Obligatory | Level of course | S1 |
| **Semester**  | Summer/Winter | Language of instruction | English |
| **Hours per week** | 2 (1L + 1W) | Hours per semester | 30 (15L+ 15W) |
| **Teaching method** | Lecture (2 hr/week, 15 weeks).Workshop (2 hr/week, 15 weeks). |
| **Objectives of the course** | Understanding the basics of water distribution, storm and sanitary sewerage systems for providing a community with adequate water supply, collecting and disposing storm water, and managing excess storm water flow. Understanding the basic design criteria and the hydraulic/hydrologic analysis for gravity flow and flow under pressure. |
| **Entry requirements** | Understanding Technical Drawing. Understanding AutoCAD. Hydrology and Hydraulics.  |
| **Course contents** | Municipal infrastructure – general design and analyses considerations. General requirements for sustainable land development. Water distribution network hydraulic analysis and conceptual design. Storm and sanitary sewerage system analysis and conceptual design. Major design criteria, calculations and standards.Preparing a conceptual site servicing plan for a small community. |
| **Assessment methods** | Grade, project work. |
| **Recommended readings** | 1. Civil Engineer’s Reference Book (4th Edition), Blake, Leslie S., Taylor & Francis, 1989
2. Sizing Water Services Lines & Meters – Manual of Water Supply Practices, M22 (2nd Edition), AWWA 2004.
3. Gravity Sanitary Sewer Design & Construction (2nd Edition), Bizier, Paul, ASCE 2007.
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| **Additional information** | 1. Residential Services & Site Planning Standards
2. Design criteria and standard drawings.
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| **Course title** | **DESIGN OF WATER SUPPLY AND WASTE CONVEYANCE SYSTEMS** |
| **Person responsible for the course** | Dorota Stocka, M.A.Sc., P.Eng. | E-mail address to the person responsible for the course | Dorota.Stocka@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/W/-/44 | ECTS points | 5 |
| **Type of course** | Elective | Level of course | S1 |
| **Semester**  | Summer/Winter | Language of instruction | English |
| **Hours per week** | 4 (2L + 2W) | Hours per semester | 60 (30L+ 30W) |
| **Teaching method** | Lecture (2 hr/week, 15 weeks).Workshop (2 hr/week, 15 weeks). |
| **Objectives of the course** | Understanding the principles of water distribution, storm and sanitary sewerage systems. Understanding the approval, planning and design processes. Obtaining an awareness of the applicable Acts and regulations. Understanding the basic design criteria and the hydraulic analysis for sanitary sewers and water distribution systems. Understanding the design criteria and the hydrology and hydraulic analysis for storm water/drainage systems. Preparing detailed conceptual site servicing plan for a residential development. |
| **Entry requirements** | Understanding Technical Drawing. Understanding AutoCAD. Hydrology and Hydraulics.  |
| **Course contents** | Municipal infrastructure – general design and analyses considerations. General requirements for sustainable land development. Water distribution network hydraulic analysis and design. Storm and sanitary sewerage system detailed design. Design criteria, calculations and standard drawings. |
| **Assessment methods** | Exam, grade project work. |
| **Recommended readings** | Civil Engineer’s Reference Book (4th Edition), Blake, Leslie S., Taylor & Francis, 1989Sizing Water Services Lines & Meters – Manual of Water Supply Practices, M22 (2nd Edition), AWWA 2004.Gravity Sanitary Sewer Design & Construction (2nd Edition), Bizier, Paul, ASCE 2007. |
| **Additional information** | Residential Services & Site Planning StandardsDesign criteria and standard drawings. |

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| **Course title** | **SUSTAINABLE WATER MANAGEMENT**  |
| **Person responsible for the course** | Dorota Stocka, M.A.Sc., P.Eng. | E-mail address to the person responsible for the course | Dorota.Stocka@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/B/S1/BW/-/48 | ECTS points | 3 |
| **Type of course** | Elective | Level of course | S1 |
| **Semester**  | Summer/Winter | Language of instruction | English |
| **Hours per week** | 2 (1L + 1W) | Hours per semester | 30 (15L+ 15W) |
| **Teaching method** | Lecture (1 hr/week, 15 weeks).Workshop (1 hr/week, 15 weeks). |
| **Objectives of the course** | Understanding the basics of sustainable water management. Understanding the purpose of application of green infrastructure in sustainable surface water management practice. |
| **Entry requirements** | Basic Hydrology and Hydraulics. Level S1 Civil Engineering. |
| **Course contents** | Introduction to the concept of sustainability and the idea of sustainable water management. Introduction to the non-traditional “green” infrastructure in civil engineering. Introduction to the major Green Infrastructure design considerations: environmental protection, streams habitat protection, protection of soils and vegetation, pollution prevention planning, sustainable urban landscapes and subsurface utility engineering.Preparing conceptual plan for residential lot development with application of green infrastructure. |
| **Assessment methods** | Grade, project work. |
| **Recommended readings** | Sustainable Design – The Science of Sustainability and Green Engineering. Vallero, Daniel; Brasier, Chris. John Wiley & Sons. 2008.Develop with Care 2012. Environmental Guidelines for Urban and Rural Land Development in British Columbia. Canada. 2012. (On-line pdf document). |
| **Additional information** |  |

**SECOND DEGREE**

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| **Course title** | **SELECTED ISSUES OF WATER AND WASTE WATER - SUSTAINABLE STORMWATER MANAGEMENT** |
| **Person responsible for the course** | Dorota Stocka, M.A.Sc., P.Eng. | E-mail address to the person responsible for the course | Dorota.Stocka@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/ | ECTS points | 5 |
| **Type of course** | Elective | Level of course | S2 |
| **Semester**  | Summer/Winter | Language of instruction | English |
| **Hours per week** | 3 (1L + 2W) | Hours per semester | 45 (15L+ 30W) |
| **Teaching method** | Lecture (1 hr/week, 15 weeks).Workshop (2 hr/week, 15 weeks). |
| **Objectives of the course** | Understanding the concept of sustainable storm water management in the light of sustainable land development and sustainable water resources management. |
| **Entry requirements** | Basic Hydrology and Hydraulics. Basic Civil Engineering. |
| **Course contents** | Introduction to the concept of sustainable storm water management. Introduction to the innovative “green” infrastructure and engineering standards for the sustainable design of new urban communities. Introduction to the USEPA documents and European guidelines for the Best Management Practices (BMPs), flood protection designs in urban watersheds. Introduction to the major Green design considerations: environmental protection; Stream habitat protection; Pollution prevention; Protection of soils and vegetation; source controls. Workshops: Case studying to some of the leading green infrastructure projects.  |
| **Assessment methods** | Grade, project work. |
| **Recommended readings** | 1. The Use of Best Management Practices (BMPs) in Urban Watersheds. USEPA. 2004.
2. Develop with Care 2012. Environmental Guidelines for Urban and Rural Land Development in British Columbia. Canada. 2012. (On-line pdf document).
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| **Additional information** |  |

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| **Course title** | **COMPUTER METHODS IN MUNICIPAL INFRASTRUCTURE ANALYSIS & DESIGN** |
| **Person responsible for the course** | Dorota Stocka, M.A.Sc., P.Eng. | E-mail address to the person responsible for the course | Dorota.Stocka@zut.edu.pl |
| **Course code** **(if applicable)** | WBiA/ | ECTS points | 4 |
| **Type of course** | Elective | Level of course | S2 |
| **Semester**  | Summer/Winter | Language of instruction | English |
| **Hours per week** | 3W | Hours per semester | 45W |
| **Teaching method** | Workshop (3 hr/week, 15 weeks). |
| **Objectives of the course** | Understanding the practical application of various computer methods and software in civil/municipal infrastructure (water and wastewater, sanitary sewerage, storm drainage) analysis, modeling and design. Understanding the need for computer modeling simulation in civil and environmental engineering design and network management. Understanding spreadsheets, equitation-solving software, and modeling processes. Understanding the input data and output results readings.  |
| **Entry requirements** | Understanding Technical Drawing. Understanding AutoCAD. Hydrology and Hydraulics.  |
| **Course contents** | Review of the computer methods, applications and software available in the industry sector for the water, sewage and storm water systems analysis and design. Studying the requirements for Input data for each type of system and for the method or software used. Hands-on application of computer methods and software. Understanding the output data and learning the design process.Preparing small projects for each method learned during this course. |
| **Assessment methods** | Grade, project work. |
| **Recommended readings** | Water distribution modeling; Walski Thomas, Chase Donald, Savic Dragan; Haedstad Methods – Waterbury Haedstad Press, 2001.Stormwater conveyance, modeling and design; Durrans Rocky; Haedstad Methods.- Waterbury Haedstad Press, 2003. |
| **Additional information** |  |