Faculty: Civil Engineering
Course of studies: Civil Engineering
Cycle: Bachelor
Course offer for the Winter semester

Lp.	Course Code	Course	Hours	Sem	ECTS	Syllabus
1	1120-BU000-ISA-9001	Mathematics I - Calculus I	60 h (30 h Lecture 30 h Workshop)	1	5	**Name of course:** Mathematics I - Calculus I
2	1120-BU000-ISA-9003	Mathematics II - Algebra with Geometry	60 h (30 h Lecture 30 h Workshop)	1	6	**Name of course:** **Mathematics II - Algebra with Geometry**
3	1080-BU000-ISA-0410	Building Chemistry	60 h (30 h Lecture 30 h Laboratory)	1	5	**Name of course:** **Building Chemistry**
4	1080-BU000-ISA-0301	Descriptive Geometry I	30 h (15 h Lecture 15 h Project)	1	3	**Name of course:** **Descriptive Geometry I**
5	1080-BU000-ISA-0303	Technical Drawing I	30 h (30 h Project)	1	3	**Name of course:** **Technical Drawing I**
6	1080-BU000-ISA-0351	Surveying I	45 h (15 h Lecture 15 h Workshop 15 h Laboratory)	1	3	**Name of course:** **Surveying I**
7	1080-BU000-ISA-0305	Information Technologies	45 h (15 h Lecture 30 h Workshop)	1	3	Name of course: Information Technologies
8	1080-BU000-ISA-0412	Building Materials II	75 h (30 h Lecture 45 h Laboratory)	3	6	**Name of course:** **Building Materials II**
9	1080-BU000-ISA-0402	Strength of Materials I	90 h (45 h Lecture 23 h Workshop 22 h Project)	3	7	**Name of course:** **Strength of Materials I**
10	1080-BU000-ISA-0441	Transportation Engineering I	45 h (30 h Lecture 15 h Project)	3	4	**Name of course:** **Transportation Engineering I**
11	1080-BU000-ISA-0421	Fundamentals of Building I	60 h (30 h Lecture 30 h Project)	3	4	**Name of course:** **Fundamentals of Building I**

12	1080-BU000-ISA-0308	Mathematics III - Numerical Methods	45 h (15 h Lecture 30 h Laboratory)	3	3	**Name of course:** **Mathematics III - Numerical Methods**
13	1050-BU000-ISA-9050	Physics II - Experimental Physics	30 h Laboratory	3	2	**Name of course:** **Physics II - Experimental Physics**
14	1080-BU000-ISA-0420	Physics III - Building Physics	45 h (15 h Lecture 30 h Project)	5	3	**Name of course:** **Physics III - Building Physics**
15	1080-BU000-ISA-0481	Soil Mechanics and Geotechnical Engineering I	60 h (30 h Lecture 30 h Laboratory)	5	4	**Name of course:** **Soil Mechanics and Geotechnical Engineering I**
16	1080-BU000-ISA-0451	Concrete Structures I	60 h (30 h Lecture 30 h Project)	5	4	**Name of course:** **Concrete Structures I**
17	1080-BU000-ISA-0461	Metal Structures I	60 h (30 h Lecture 30 h Project)	5	4	**Name of course:** **Metal Structures I**
18	1080-BU000-ISA-0404	Mechanics of Structures I	60 h (30 h Lecture 15 h Workshop 15 h Project)	5	4	**Name of course:** **Mechanics of Structures I**
19	1080-BU000-ISA-0357	Hydraulics and Hydrology	30 h (15 h Lecture 15 h Project)	5	2	**Name of course:** **Hydraulics and Hydrology**
20	1080-BU000-ISA-0432	Technology and Organization of Building Works II	60 h (60 h Project)	5	4	**Name of course:** **Technology and Organization of Building Works II**
21	1080-BU000-ISA-0611	Architecture and Urban Planning	45 h (15 h Lecture 30 h Project)	7	3	**Name of course:** **Architecture and Urban Planning**
22	1080-BU000-ISA-0202	HC – Basis of Economics	30 h (30 h Workshop)	7	2	**Name of course:** **HC – Basis of Economics**

23	1080-BU000-ISA-0904	Sanitary Installations	30 h (15 h Workshop 15 h Project)	7	2	**Name of course:** **Sanitary Installations**
24	1080-BU000-ISA-0701	Electrical Installations	30 h (30 Lecture)	7	1	**Name of course:** **Electrical Installations**

Name of course: Mathematics I - Calculus I

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1120-BU000-ISA-9001

Number of ECTS credits: 5

Language of course: English

Form of didactic studies and number of hours per semester:

- Lecture 30h
- Exercise type of course 30h

Preliminary requirements:

Advanced knowledge of mathematics from secondary school.

Purpose of course:

1. Making the students familiar with elements of the modern mathematical analysis. 2. Making the students use the mathematical analysis in practice.

Contents of education:

1. Sets of numbers. Sequences and their properties. Basic theorems about sequences. Bounded monotone sequences. Number e. 2. Real functions of one variable. Limits of functions. Continuous functions. Derivatives and differentials of functions. Principal theorems about differential functions: Rolle's, Lagrange's, Taylor's. Indeterminate forms and l'Hospital Rule. Extrema of functions and Fermat's Theorem. Convexity and concavity of functions. Points of inflection. Asymptotes of graphs of functions. 3. Antiderivative (primitive) and in definite integral. Change of variables in the in definite integral (integration by substitution). Integration by parts. Integration of rational and trigonometric functions. 4. Functions of several variables - limits, continuity, partial derivatives. Extrema of functions of several variables.

Methods of evaluation:

The subject is assessed on the basis of the sum of points obtained on tutorials (four written tests and student's activity during classes) and on the written exam, consisting of two parts: theoretical questions and practical problems similar to those solved on tutorials.

Exam: yes

Literature:

[1] G. B. Thomas, M. D. Weir, J. R. Hass, "Thomas' Calculus", Pearson Addison Wesley; [2] R. A. Adams, C. Essex, "Calculus. A complete course", Pearson Addison Wesley; [3] S. K. Stein, "Calculus and Analytic Geometry", McGraw-Hill Book Company; [4] Auxiliary materials. The set of problems for tutorials.

Website of the course: https://moodle.usos.pw.edu.pl/

Notes:

Effects of education

General academic profile - knowledge

Charakterystyka K1_W01

The graduates have knowledge of mathematics and physics enabling them to describe and understand basic phenomena in the field of civil engineering.
Verification: Tests, exam.
Field of study related learning outcomes: K1_W01
Area of study related learning outcomes: P6U_W, I.P6S_WG.o

General academic profile - skils

Charakterystyka K1_U01

The graduates can apply mathematical methods of algebra and calculus for the analysis of basic physical and technical problems, use the rules of mathematical logics, and can use computational methods in engineering calculations.
Verification: Tests.
Field of study related learning outcomes: K1_U01
Area of study related learning outcomes: P6U_U, I.P6S_UW.o

Name of course: Mathematics II - Algebra with Geometry

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1120-BU000-ISA-9003

Number of ECTS credits: 6

Number of hours of student’s work to achieve learning outcomes:

Lectures 30 h, tutorials 30 h, preparation for classes, homework 60 h, preparation for tests 15 h, preparation for the exam and the exam 15 h. Total 150 hours = 6 ECTS.

Number of ECTS credits on the course with direct participation of academic teacher:

Lectures 30 h, tutorials 30 h, exam 8 h. Total 68 hours = 3 ECTS.

Language of course: English

Number of ECTS credits on practical activities on the course:

Tutorials 30 h, preparation for classes, homework 60 h. Total 90 hours = 3,5 ECTS.

Form of didactic studies and number of hours per semester:

Lecture:	30h
Exercise type of course:	30h

Preliminary requirements:

Advanced knowledge of mathematics from secondary school.

Purpose of course:

1. Making the students familiar with elements of modern algebra, analytical geometry and differential geometry. 2. Making the students use algebra and geometry in practice.

Contents of education:

1. Groups and fields. 2. The field of complex numbers. 3. Vector spaces. Basis and dimension of a vector space. 4. Matrices. Operations on matrices. 5. Linear transformations. 6. Determinants and their properties. 7. Rank of a matrix. Systems of linear equations. 8. Eigenvalues and eigenvectors of linear transformations. 9. Quadratic forms. 10. Vectors in three dimensions. The scalar, vector and triple scalar product of vectors. 11. Planes and lines in space. 12. Surfaces in space. 13. Parametric equations of space curves. 14. The Frenet trihedron. 15. Curvature and torsion of a space curve. 16. Tangent plane and normal line to a surface.

Methods of evaluation:

Obligatory conditions to fulfil: 1. Credit for classes achieved by passing two tests and taking into consideration students' activity during classes; 2. Passing a written exam including practical and theoretical problems.

Exam: yes

Literature:

[1] A Concise Introduction to Linear Algebra; Schay, Géza, 2012. [2] Linear Algebra; Hefferon, Jim, 2021. [3] S. K. Stein, Calculus and Analytic Geometry, McGraw –Hill Book Company, 1987. [4] David Poole, Linear Algebra (a modern introduction), Thomas Books/Cole, 2006. [5] S.Lipschutz, M.Lipson, Linear Algebra, McGraw-Hill Book Company, 2001. [6] Auxiliary materials. The set of exercises.

Website of the course:

https://moodle.usos.pw.edu.pl/

Charakterystyki przedmiotowe

General academic profile - knowledge

Charakterystyka K1_W01:

The graduates have knowledge of mathematics and physics enabling them to describe and understand basic phenomena in the field of civil engineering.

Verification:

Tests and exam.

Powiązane charakterystyki kierunkowe: K1_W01

Powiązane charakterystyki obszarowe: P6U_W, I.P6S_WG.o

General academic profile - skils

Charakterystyka K1_U01:

The graduates can apply mathematical methods of algebra and calculus for the analysis of basic physical and technical problems, use the rules of mathematical logics, and can use computational methods in engineering calculations.

Verification:

Tests and exam.

Powiązane charakterystyki kierunkowe: K1_U01

Powiązane charakterystyki obszarowe: P6U_U, I.P6S_UW.o

Name of course: Building Chemistry

Coordinator of course: prof. dr hab. inż. Paweł Łukowski i dr inż. Justyna Kuziak

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0410

Number of ECTS credits: 5

Number of hours of student's work to achieve learning outcomes:

The lecture - 30 h, the laboratory - 30 h, the preparation for laboratory classes - 15 h, the preparation of laboratory reports - 25 h, the preparation for the exam and the presence on the exam - 25 h; TOTAL: 125 h = 5 ECTS

Number of ECTS credits on the course with direct participation of academic teacher:

The lecture - 30 h, the laboratory - 30 h, the presence on the exam - 2 h; TOTAL: 62 h = 2,5 ECTS

Language of course: English

Number of ECTS credits on practical activities on the course:

The laboratory - 30 h, the preparation for laboratory classes - 15 h, the preparation of laboratory reports - 25 h, the preparation for the exam and the presence on the exam - 25 h; TOTAL: 95 h = 4 ECTS

Form of didactic studies and number of hours per semester:

Lecture:	30h
Laboratory:	30h

Preliminary requirements:

Knowledge and understanding of the periodic system of the elements and properties of the basic chemical compounds. Ability to use the chemical notation towards the chemical reactions and performing the basic stoichiometric calculations. Recognition of the basic physical and chemical processes.

Purpose of course:

Understanding of the basic chemical processes and analyzing of the physico-chemical phenomena taking place during production and using of the building materials and building objects; safe using of the building materials; consciousness of the problems involved with selection and utilization of the waste materials.

Contents of education:

Lectures: Basic ideas in the building chemistry. Chemical conditions in the system: material - structure - technology - ecology. Chemical composition and structure of the building materials as the basis for their technical properties. System and environment. Thermodynamical conditions of durability of the building materials. Phase transitions. Types of chemical compounds occurring in the construction. Crystal chemistry of the building materials. Structures of the silicates. Structure and chemical properties of the water and their consequences. Significance of the water in construction. Chemical reactions in the water solutions. Complex systems in the construction; colloids. Types of chemical processes taking place during production, application and using of the building materials. Equilibria in the reacting systems. Equilibrium constants. Le-Chatelier-Brown's rule. Kinetics of the chemical reactions in the construction. Catalysis. Chemistry of the mineral binders. Hydraulic and non-hydraulic binders. Processes taking place during production, setting and hardening of the cement, lime, gypsum, silicate and magnesia binders. Structure and properties of the metals used in the construction. Polymers as the component of building plastics. Production of polymers - polyreactions. Properties and internal structure of the polymers: linear, cross-linked. Corrosive processes in the building materials. Corrosion of concrete and reinforced concrete. Usefulness of the building chemistry for resolving of the engineering and scientific problems involved with construction. Laboratories: Elements of chemical analysis: investigation of the qualitative and quantitative composition of the building materials. Kinetics of the chemical processes: investigation of the effect of temperature and concentration on the rate of chemical reactions. Water in construction: requirements for the mixing water in the light of the European standards, chemical analysis of the water for the construction purposes. Cement binders: investigation of the setting of the Portland cement and determination of the composition of the concrete. Lime binders: investigation of the chemical composition of lime. Gypsum binders: investigation of the effect of

chemical modification on the properties of gypsum, investigation of the effect of roasting conditions on the structure and properties of the gypsum. Silicate binders: determination of the modulus of the water glass. Resin binders: investigation of hardening of the resin binders, determination of the effect of the water on the hardening of the resin binders. Chemical modification of concrete: evaluation of the effectiveness of plasticizers and superplasticizers, evaluation of efficiency of hydrophobization of the concrete surface. Corrosion of the building materials: investigation of the process of concrete and metals corrosion, estimation of the chloride contamination and neutralisation of the concrete.

Methods of evaluation:

Written exam. Tests and reports during laboratory exercises.

Exam: yes

Literature:

[1] R.M.E. Diamant: Chemistry of building materials. Business Books Ltd, London, first edition 1970; [2] T. Mallon: The chemistry of construction materials. Vogel Bauverlag, 2005; [3] J.F Young, S. Mindess, R.J. Gray, A. Bentur: The science and technology of civil engineering materials. Prentice Hall International, USA, 1998; [4] L. Czarnecki, P. Łukowski, A. Garbacz, B. Chmielewska, J. Kuziak: Building chemistry - laboratory exercises, OWPW, Warszawa 2016.

Website of the course:

http://pele.il.pw.edu.pl/moodle/course/view.php?id=40

General academic profile - knowledge

Charakterystyka W1:

Student knows the properties, production and application of basic building binders; students knows the basic chemical processes occuring during setting the most commonly used binders and processes of metal and concrete corrosion.

Verification: Quiz and exam.

Powiązane charakterystyki kierunkowe: K1_W08

Powiązane charakterystyki obszarowe: P6U_W, I.P6S_WG.o

General academic profile - skils

Charakterystyka U1:

Student is able to use titration methods in chemical analysis, can detect the most common cations and anions in building materials, can estimate the degree of concrete carbonatization.

Verification: Exam, quiz.

Powiązane charakterystyki kierunkowe: K1_U12

Powiązane charakterystyki obszarowe: P6U_U, I.P6S_UW.o, III.P6S_UW.o

Charakterystyka U2:

Student is able to determine the influence of corrosive agents such as acids, chlorides, sulphates, carbon dioxide, freezing and thawing on concrete structures. Student is able to use the basic methods of corrosion protection of concrete and metal.

Verification: Exam, quiz

Powiązane charakterystyki kierunkowe: K1_U03, K1_U15

Powiązane charakterystyki obszarowe: P6U_U, I.P6S_UW.o, III.P6S_UW.o

General academic profile - social competences

Charakterystyka K1:

The student is aware of many years of traditions related to the role of building chemistry in the construction industry and is ready to creatively use the knowledge resulting from the traditions of the engineer profession. At the same time, student is prepared to use in a wide range the achievements of modern building chemistry, including its latest achievements. Student is also aware of the need to use the knowledge of specialists in a given field in solving problems related to the chemistry of building materials.

Verification: Quiz.

Powiązane charakterystyki kierunkowe: K1_K07, K1_K08

Powiązane charakterystyki obszarowe: P6U_K, I.P6S_KK, I.P6S_KR

Name of course: Descriptive Geometry I

Coordinator of course: dr hab. inż. Grzegorz Dzierżanowski

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0301

Number of ECTS credits: 3

Number of hours of student's work to achieve learning outcomes:

Calculating points ECTS: lectures - 15h, tutorials - 15h, preparation for class work - 10h, execution of 10 drawings (exercises) - 15h, reading professional literature - 10h, preparation for 3 written tests - 10h. Total - 75h i.e. 3 ECTS

Number of ECTS credits on the course with direct participation of academic teacher:

Courses requiring direct participation of teacher: lectures - 15h, work shops - 15h, consultations for projects (exercises) - 15h. Total - 45h i.e. 2 ECTS.

Language of course: English

Number of ECTS credits on practical activities on the course:

Tutorials - 15h, preparation for class work - 10h, execution of 10 drawings (exercises) - 15h Total - 40h i.e. 1.5 ECTS

Form of didactic studies and number of hours per semester:

Lecture:	15h
Project type of course:	15h

Preliminary requirements:

Minimal preparation in geometry: Basic knowledge of plane geometry (secondary school program of mathematics): properties of triangles; regular polygons; parallelism and perpendicularity; constructions (by using a ruler and compasses) involving straight lines and circles, particularly tangents to circles. Elementary knowledge of 3D-space geometry (secondary school program of mathematics): straight lines, planes and relationships; dihedral angles; distances; parallelism and perpendicularity in the space; solids; regular polyhedrons, etc.

Purpose of course:

Mathematical approach to engineering graphics. Introductory course in engineering geometry: a review of principal geometric methods to give an one-to-one representation of 3D-space on a plane. Aims of the subject are pedagogical, mathematical and practical. Pedagogical: To introduce the student to ideas and ways of thinking, without use of numbers, which generally are new to him, and thus to form and develop his 3D-space imagination, as well as the ability of logical thinking and coming to right conclusions concerning 3D-space systems. Mathematical: To give rudiments of projective geometry. To study fundamental properties of central projection (perspective). To study the principle and properties of parallel projection: axonometric and orthogonal projections (Monge's projections). Practical: To give a working knowledge of the engineer's language: how to make and how to read drawings. To become familiar with presented methods and acquire the ability to specify their use with assurance, particularly: to make pictorial drawings (freehand or with instruments) of polyhedrons or surfaces of revolution with cut-out by using the principle of vertical perspective or axonometry, to represent objects by drawing their orthogonal projections and to use principal constructions of this method to find the true shape and size of objects represented by their orthographic views as well. To apply obtained skills to solve some problems concerning certain roofs.

Contents of education:

Ideal elements and projective space. Central projection: the principle of the one-to-one transformation and basic constructions; image of points, straight lines and planes; restitution; ground plane - relationships between plan and perspective of this plane. Vertical perspective of a polyhedron with sections by frontal, horizontal or vertical planes. Vertical perspective of a set of rectangular prisms if a plan and heights are given. Parallel projection: invariants; oblique axonometric projection. The most often used axonometric systems. Representation of polyhedrons and surfaces of revolution with removed parts. Associate axonometric systems applied for drawing joints of wooden pieces. Orthogonal projection as a particular case of parallel projection. Characteristic invariant of this projection. Reversibility of the transformation and Monge's projections. Construction of common elements. Intersection of polygons and polyhedrons. Three projections of a prism or pyramid with removed parts. Transformation of the projection planes system; auxiliary projection planes. Application of the transformation to find dihedral angles, perpendiculars to a plane, distances, projections of polyhedron sections and their true shape and size as well. Revolutions and

rabatments; application to obtain the normal view of a plane. Complete geometric design of roofs satisfying certain conditions.

Methods of evaluation:

Attendace at classes - 10 points [10%]. Tutorial: two written tests and three projects - (2x33 + 3x4) points [78%]. Lectures: one written test - 12 points [12%].

Literature:

[1] Łapińska C.: Descriptive Geometry, Oficyna Wydawnicza PW. Warszawa 2016 [2] Bieliński A.: Geometria wykreślna, Oficyna Wydawnicza PW, Warszawa 2015. [3] French Th. E.: Graphic Science and Design, Mc GRAW-HILL Book Company, Inc. [4] French Th. E., Vierck Ch. J.: Graphic Science, Mc GRAW-HILL Book Company, Inc. [5] Przewłocki S.: Geometria wykreślna w budownictwie, Arkady Warszawa 1997. [6] Ryan D. L.: CAD/CAE Descriptive Geometry, CRC Press, Inc. [7] Standiford K., Standiford D.: Descriptive Geometry An Integrated Approach Using AutoCAD. [8] Woolf S.: An Elementary Course in Descriptive Geometry, Barnes & Noble. [9] C. Łapińska: Descriptive Geometry I - Lectures & Exercises, script available for students in electronic form on PELE.

General academic profile - knowledge

Charakterystyka W1:

After completing the course the student knows basic notions of projective geometry.

Verification:

Written tests, graded self-study problems.

Charakterystyka W2:

The student knows principles and fundamental properties of the following three methods of a reversible representation of 3D space on 2D plane: central projection, axonometric projection and Monge's projections.

Verification:

Written tests, graded self-study problems.

General academic profile - skils

Charakterystyka U1:

After completing the course the student has learnt how to analyze relations between elements of 3D space and how to represent them in a planar drawing .

Verification:

Written tests, graded self-study problems.

Charakterystyka U2:

The student is familiar with taught methods and can specify their use, particularly: can make pictorial drawing of objects in central projection, axonometric projection and Monge's projections.

Verification:

written tests, graded self-study problems

General academic profile - social competences

Charakterystyka K1:

After completing the course the student is able to perform individual and team work.

Verification:

Evaluation of solutions to self-study problems and in-class activity

Charakterystyka K2:

After completing the course the student has been accustomed to the meticulous work and punctuality.

Verification:

Evaluation of the timely submission of solutions to self-study problems.

Name of course: Technical Drawing I

Coordinator of course: dr inż. arch. Eliza Maciejewska, dr inż arch. Piotr Bujak

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0303

Number of ECTS credits: 3

Number of hours of student's work to achieve learning outcomes:

Ects credits: 3, including 1.0 (students' work during classes with teachers' help) + 2.0 (working at home, projects drafting).

Number of ECTS credits on the course with direct participation of academic teacher:

1.0 - students' work during classes with teachers' help.

Language of course: English

Number of ECTS credits on practical activities on the course:

2.0 - working at home, projects drafting.

Form of didactic studies and number of hours per semester:

Project type of course: 30h

Preliminary requirements:

None

Purpose of course:

During the classes students are provided with a basic knowledge and practical skills of technical drawing and freehand drawing. Discussing subject matter and the scope of design exercises prepare students for next years' projects, most of all for engineering constructions (concrete and metal structures).

Contents of education:

Presentation of technical drafting table and equipment, materials, recommended reading (including Polish and European Standards). Introduction to basic rules and methods which will let students communicate visual ideas and objects as orthographic and perspective views. Examples of course topics: technical lettering, technical drafting, perspective views, engineering drawings of concrete and metal structures. Freehand drawing: Drawing exercises that develop students spatial imagination and give them skills necessary to facilitate clear communication in their future careers. Examples of course topics: linework, methods of perspective sketches, compositions of basic solids (sketches from models).

Methods of evaluation:

To complete the course students must obtain positive grades in all design projects, technical lettering exercises and the final test.

Exam: no

Literature:

[1] Polish and European Standards and regulations; [2] E.Neufert. "Architect's data"; [3] Technical drawing textbooks like for example A. Tofiluk, J. Mazur "Dokumentacja budowlana 1. Rysunek budowlany"; [4] S. Kubba "Blueprint Reading: Construction Drawings for the Building Trades"; [5] David L. Goetsch "Technical drawing".

General academic profile - knowledge

Charakterystyka W1:

Student shoud be familiar with appropriate conventions and standards in producing and interpretig technical drawings.

Verification:

Assessment of drawing works.

General academic profile - skils

Charakterystyka U1:

Student is able to prepare and interpret technical building drawings. Student is also able to interpret other (different specialities') technical drawings.The student is able to find, choose and collect building information using appropriate means, such as libraries and the internet.

Verification:

Assessment of drawing works.

General academic profile - social competences

Charakterystyka K1:

Student is able to work alone and independently.

Verification:

Assessment of drawing works.

Name of course: Surveying I

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0351

Number of ECTS credits: 3

Number of hours of student's work to achieve learning outcomes:

Lecture 15 hrs, Class 15 hrs, Lab 15 hrs, preparation for classes & labs 10 hrs, software operation, "WinKalk" and "MikroMap" (or equivalent) 20 hrs. Total 75 hrs. 3 ECTS points.

Number of ECTS credits on the course with direct participation of academic teacher:

Lecture 15 hrs, Class 15 hrs, Lab 15 hrs. Total 45 hrs. 2 ECTS.

Language of course: English

Number of ECTS credits on practical activities on the course:

Preparation for classes and labs 15 hrs, software operation, 'WinKalk' and MikroMap' (or equivalent) 20 hrs. Total 35 hrs. 1.5 ECTS.

Form of didactic studies and number of hours per semester:

Lecture:	15h
Exercise type of course:	15h
Laboratory:	15h

Preliminary requirements:

Secondary/high school mathematics, geometry, physics and geography.

Purpose of course:

The aim of this course is to cover fundamentals of surveying to enable students to understand and execute surveyor's duties. The all theory presented during lectures will be accompanied by practical assignments and tutorials. After completion of this course, student should be able to perform some basic field surveys using surveying equipment and communicate results in written and presentation style formats, as well as liaise with professional surveyor on construction site.

Contents of education:

The scope of the course: Principles of Surveying. Figure of Earth. Map Projections. Basic Surveying in Civil Engineering. General overview of Surveying Measurements. Surveying principles and rules. Principal Map. Topographic Maps. Surveying Horizontal and Vertical Control Networks. Global Positioning System (GPS). Geographic and Land Information Systems. Angular and Linear Measurements. Tying of Surveying Measurements. Computations of Plane Coordinates. Situation Detail Measurements.

Methods of evaluation:

During the semester student takes two tests covering entire scope of material presented on lectures, classes and labs. Student executes individually projects and assignments.

Literature:

[1] Jack McCormac - Surveying, 5th edition; [2] John Muskett - Site Surveying, 2nd edition; [3] Wiliam Irvine and Finlay Maclennan - Surveying for construction, 5th edition; [4] Alfred Leick - GPS Satellite Surveying, 3rd edition; [5] Adam and Sabina Lyszkowicz - Surveying; [6] Hycner R. , Dobrowolska-Wesolowska M. - Geodesy, Surveying and Professional Ethics.

General academic profile - knowledge

Charakterystyka W1:

Knows what principal map is and what it is for. Knows how to execute simple surveying calculations and rules that the map creation is based on.

Verification:

Two written tests. Evaluation of individually prepared assignments and/or projects.

General academic profile - skils

Charakterystyka U1:

Is able to adjust a simple surveying control network by the approximate method. Have skills to create a simple principal map.

Verification:

Assessment of assignments/projects.

General academic profile - social competences

Charakterystyka K1:

Is able to work as part of surveying team and/or on his/her own.

Verification:

Assessment of work / involvement during measurement practices.

Name of course: Information Technologies

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0305

Number of ECTS credits: 3

Number of hours of student's work to achieve learning outcomes:

Calculation of ECTS (3): participation in laboratories 30, participation in lectures 15, literature studies 5, preparation for laboratories 10, preparation for practical test 5, homeworks (projects) 5, preparation to theoretical test 5.

Number of ECTS credits on the course with direct participation of academic teacher:

Calculation of ECTS (2): participation in laboratories 30, participation in lectures 15.

Language of course: English

Number of ECTS credits on practical activities on the course:

Calculation of ECTS (2): participation in laboratories 30, preparation for laboratories 10, preparation for practical test 5, homeworks (projects) 5.

Form of didactic studies and number of hours per semester:

Lecture:	15h
Computer lessons:	30h

Preliminary requirements:

None

Purpose of course:

Clarification of basic principles of effective usage of information technologies (IT) in civil engineering through assimilation and appropriate interpretation of basic terms and concepts of computational science. Development of skills that allow to chose appropriate IT tools for the specified problems. Teaching of such a way of specification of problems that allow to solve these problems with use of IT tools. Getting to know new tendencies and trends in IT and forming a routine of learning and searching for sources of information about new possibilities of IT. Accomplishment of these aims make possible for students to improve their working environment of engineer and to recognize new sources of information. Effective usage of contemporary (modern) forms of communication and gaining of information. Modern and efficient ways of obtaining required results with use of various electronic media and aid of learning process as well as getting the knowledge in various fields through usage of electronic publications.

Contents of education:

Taxonomy of IT problems in civil engineering. Basics of functioning of operational systems. Information about principles of functioning, usage, technical possibilities and configurations of modern IT hardware and software being inseparable. Principles of configuration and usage of computer networks. Knowledge on basic nature of information and its functions, proper

interpretation and usage of information, appropriate choice of information sources as well as technical ways of gathering, storing and distribution of information and elements of multi-media technologies.

Methods of evaluation:

Three practical tests, homework (project), test of theoretical knowledge.

Exam: no

Literature:

[1] Ronald W. Larsen, Introduction to MathCAD 15, Prentice Hall, 2010. [2] Ronald W. Larsen, Engineering with Excel, Prentice Hall, 2008. [3] Philip Pritchard, Mathcad: A Tool for Engineering Problem Solving, McGraw Hill, 2011. [4] Jackie Sherman, Practical Exercises for Ecdl Using Office Xp & 2003, Prentice Hall, 2008.

General academic profile - knowledge

Charakterystyka W1:

Knows the theoretical foundations of information processing and storage, and how to conduct engineering calculations, along with elements of programming.

General academic profile - skils

Charakterystyka U1:

Has the ability to use sources of literature and Internet resources for the analyzed issues.

Charakterystyka U2:

Can lead engineering calculations using tools like spreadsheets and mathematical assistant.

Charakterystyka U3:

Can formulate and programm simple algorithms in the selected environment.

Charakterystyka U4:

Can choose the right IT tools to solve a specific problem and use them correctly.

General academic profile - social competences

Charakterystyka K1:

Is able to work independently and in teams. Is aware of the need for self-education. Can communicatively present the results of their work.

Name of course: Building Materials II

Coordinator of course: Piotr Woyciechowski, Dr hab.inż.

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0412

Number of ECTS credits: 6

Number of hours of student's work to achieve learning outcomes:

presence on the lectures 30 h, presence on the laboratory classes 45 h, preparing to the laboratory classes 25 h, reading of technical literature 15 h, preparing of Reprots form laboratory classes 25 h, consultations 4h, preparing multimedial presentation 15 h, preparing to the examination (sem 2 and 3) 13 h, repetition befor examination 2h, writen and oral examination 3h, total 177 h.

Number of ECTS credits on the course with direct participation of academic teacher:

presence on the lectures 30 h, presence on the laboratory classes 45 h, consultations 4h, repetition befor examination 2h, writen and oral examination 3h, total 84 h ECTS 3,5

Language of course: English

Number of ECTS credits on practical activities on the course:

presence on the laboratory classes 45 h, preparing to the laboratory classes 25 h, preparing of Reports form laboratory classes 25 h, preparing multimedial presentation 15 h, total 110 h ECTS 4

Form of didactic studies and number of hours per semester:

Lecture:	30h
Laboratory:	45h

Preliminary requirements:

Basic knowledge about building materials I (sem. 2),completed laboratory Building Materials 1 (sem. 2).

Purpose of course:

Recognition of processes taking place in building materials; knowledge about scope of use and quality control of building materials and building products.

Contents of education:

Binders classification, main characteristics. Lime. Gypsum. Cement. Paste and mortar. Standards and classification of cement concrete. Concrete constituents and its role in concrete mix and concrete. Aggregates and cement. Properties of fresh concrete mixture and hardened concrete. Concrete mix design. Physicochemical processes taking place during setting and hardening of concrete in different conditions. Concrete quality control. Products made of paste, mortar and concrete. Testing of basic characteristics of cement (setting time, compression strength), lime (reactivity, fineness, strength, volume changes, setting time), gypsum (setting time, strength, sieve analysis). Standard test for normal and lightweight aggregates. Composition of aggregate blend for normal concrete (iteration method).Evaluation influence of water reducing admixtures on rheological properties of fresh concrete mixture. Concrete mix design: various methods (tree equations, paste method, Paszkowski method), designing of lightweight concrete, concrete mixture production technology, sample

moulding and curing, hardened concrete testing (strength, density).Testing technical properties of products made of mortar and concrete (hollow blocks, precast concrete).

Methods of evaluation:

Written and oral exam (Building materials 1and 2) after 3 semester. Laboratory: drawing up documentation of each test, colloquia.

Exam: yes

Literature:

[1] Mamlouk M., Zaniewski J.; Materials for Civil and Construction Engineers or other equivalent books; [2] Instructions for laboratory works (internal edition of KIMB) Standards and Instructions (EN, ASTM, ACI).

General academic profile - knowledge

Charakterystyka W1:

The Graduate has knowledge of the classification, standardization, properties and production of binders, aggregates, plastics used in construction, has a basic knowledge of building mortars, has knowledge about the main characteristics and application of ordinary and lightweight concrete.

General academic profile - skils

Charakterystyka U1:

Graduate has the ability to perform tests on the basis of materials standards and procedures for mineral binders, construction aggregates, mortars, light and ordinary cement concretes , selected plastic products; has a basic ability to design and verify the composition of cement mortars and ordinary and light cement concretes; know how to assess compliance of the material properties with the requirements.

Charakterystyka U2:

The graduate is able to work on laboratory task in team and to present its results communicatively and in accordance with standard rules for specified tests.

Verification:

Assessment of the commitment and efficiency of the team members in carrying out research; monitoring whether all members of the research team have demonstrated proficiency in all aspects of team report.

General academic profile - social competences

Charakterystyka K1:

Understands the importance of and can apply the principles of sustainable development in the design and selection of building materials. Is sensitive to the preservation of natural mineral resources.

Verification: Quiz.

Name of course: Strength of Materials I

Coordinator of course: dr hab. inż. Marcin Gajewski,prof. uczelni

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0402

Number of ECTS credits: 7

Number of hours of student's work to achieve learning outcomes:

Lecture - 45 h, tutorials - 23 h, design exercises - 22 h, preparation of design assignments - 40 h, preparation for tests - 20 h, preparation for the exam - 25 h. TOTAL - 175 h = 7 ECTS.

Number of ECTS credits on the course with direct participation of academic teacher:

Lecture - 45 h, tutorials - 23 h, design exercises - 22 h, consultation and examination - 5h. TOTAL - 95 h = 4 ECTS.

Language of course: English

Number of ECTS credits on practical activities on the course:

Tutorials - 23 h, design exercises - 22 h, preparation of design assignments - 30 h, - 75 h = 3 ECTS.

Form of didactic studies and number of hours per semester:

Lecture:	45h
Exercise type of course:	23h
Project type of course:	22h

Preliminary requirements:

Basic knowledge of calculus, including the ability of calculating derivatives, integrals and solving simple ordinary differential equations. Plotting the functions. The multivariable functions. Partial derivatives. Elements of linear algebra, the concept of vector, matrix, matrix operations, matrix eigenproblem. Basic knowledge of theoretical mechanics, such as the concept of cumulated force, the system of forces and their resultant, moments, the forces equilibrium. Modelling of ties. Active and passive forces. Statically determinate systems. Hinges in bar systems. 2D trusses. Determination of internal forces in truss systems. Kinetic energy, potential energy, the mechanical energy conservation law. The principle of virtual work. These knowledge should be documented at least credit with tutorials on Mathematics I and II and Theoretical Mechanics.

Purpose of course:

Evaluation of basic material properties – material strength properties. Understanding the concepts of stress, strain and displacements and relationships between them. Determination of internal forces in statically determinate bar systems (beams, frames, arches, trusses). Identification of basic load cases. Determination of stresses in: axially loaded, torsioned, bended and sheared elements, and stresses in

welded and riveted joints. Determination of displacements in beams based on differential equations and based on energetic theorems. Determination of displacements in simple bar systems. Solution of simple statically indeterminate beams.

Contents of education:

Introduction. Basic assumptions. Types of structures, loads and deformations. External and internal forces. 2. Internal forces in trusses. 3. Shear forces and bending moments in beams. 4. Internal forces in frames. 5. Cross-sectional properties. 6. Stress analysis in members under axial loading, torsion, shear and bending. 7. Welded and bolted connections, calculation of stresses. 8. Triaxial and plane stress, principal stresses and maximum shear stresses. 9. Deflection of beams. 10. Work and energy methods, Elastic strain energy. Clapeyron's theorem, Castigliano's theorem. Virtual work. 11. Maxwell-Mohr's formula. Calculation of displacements for beams and frames. Temperature loading, support movements, assembly errors.

Methods of evaluation:

Grades in the course will be based on the attendance, completion of the homework and test scores. The course ends with the Final Exam which consists of two parts, written and oral.

Exam: yes

Literature:

ebooks on www.bg.pw.edu.pl: [1] Nash, William. Schaum's Outline of Strength of Materials. McGraw-Hill Professional Book Group, 1998. p vi. Ebrary; http://site.ebrary.com/lib/pwarszawa/Doc?id=5002184&ppg=6 [2] Case, J.; Chilver, L.; Ross, C.T.F. Strength of Materials and Structures (4th Edition) © 1999 Elsevier. Knovel; [3] Patnaik, Surya N.; Hopkins, Dale A. Strength of Materials, ISBN-13: 9780750674027, 753 pp Butterworth-Heinemann, 2003. Engineering Village. Other (paper) books: [4] Gere J.M, Timoshenko S.P.: Mechanics of Materials; [5] Hibbeler R.C.: Structural Analysis; [6] Leet K.M., Uang C-M.: Fundamentals of Structural Analysis.

Notes:

The schedule of the class is tentative and the class pace will be adjusted according to the progress of an average student.

Charakterystyki przedmiotowe

General academic profile - knowledge

Charakterystyka W1:

Has knowledge of the basic physical and strength properties of structural materials, knows the basic methods of solving statically determinate beams, trusses, frames and arches, has knowledge of the state of stress, strain and displacement of deformable bodies

Verification: homework, tests, written and oral exams

General academic profile - skils

Charakterystyka U1:

Has the ability to determine the state of stress, strain and displacement of a linear-elastic body, is able to determine and analyze stresses and displacements in simple bar systems. Can determine

cross-sectional forces in statically determinate flat bar systems, can determine stresses and strains in axially stretched and compressed bars, bending, shear, and in welded and riveted joints, can calculate displacements in beams, can solve simple statically indeterminate bars.

Verification: project homework, written tests, written and oral exams

General academic profile - social competences

Charakterystyka K1:

Can independently interpret the final results of calculations in design exercises. Can formulate conclusions and describe the results of own work.

Verification: project exercises

Name of course: Transportation Engineering I

Coordinator of course: Piotr Olszewski, prof. dr hab. inż.

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0441

Number of ECTS credits: 4

Number of hours of student's work to achieve learning outcomes:

Total 100 h = 4 ECTS: attending lectures 30h, attending project classes 15 h; preparation, field surveys, drafting and project report 30 h, self-study and taking examination 25h.

Number of ECTS credits on the course with direct participation of academic teacher:

Total 45 h = 2 ECTS: attending lectures 30 h, attending project classes 15 h.

Language of course: English

Number of ECTS credits on practical activities on the course:

Total 45 h = 2 ECTS: attending project classes 15 h; preparation, field surveys, drafting and project report 30 h.

Form of didactic studies and number of hours per semester:

Lecture:	30h
Project type of course:	15h

Preliminary requirements:

None

Purpose of course:

Learning the basic principles of transportation system planning and management as well as the principles of designing transportation facilities, including roads and railroads. Acquiring the skills necessary to design simple transportation facilities such as: rural road segment, pavement, car park, railroad segment. Enabling students to make an informed choice of specialization later in their studies. Providing students who will later specialize in Transportation Engineering with the knowledge base necessary to study more specialized and advanced subjects in the future.

Contents of education:

LECTURES. Introduction to transport systems and modes Transport policy and development strategies. Introduction to transportation system planning. Traffic surveys and analysis Environmental impacts of traffic Traffic flow characteristics, capacity analysis. Geometric design of urban and rural roads. Design of intersections and interchanges. Traffic management and safety. Pavement design, construction and maintenance. Introduction to railroad design and construction. Introduction to air transportation engineering. Urban public transport. PROJECT I: 1. Traffic surveys - field exercise (6 hours). 2. Transportation network plan for a housing estate (9 hours).

Methods of evaluation:

Lectures: Assessment of knowledge learned is in the form of written examination of 2-hour duration. The examination involves 6-8 questions covering topics in proportion to the time spent in the lectures. Project is assessed the grade is a weighted average of component grades all of which must be positive. The following weights are used: part 1 - 0,25; part 2 - 0,75. Total subject grade is determined as a weighted average of examination (weight 0,70) and project (weight 0,30).

Exam: yes

Literature:

Lectures: No recommended textbook. Lecture presentation slides are made available to students on PELE server. Project: Handouts containing the project task description and summaries of design guidelines are prepared by lecturers involved in the projects and given to students.

General academic profile - knowledge

Charakterystyka W1:

Knows the definition of a transportation system, its components and the basic characteristics of the various modes of passenger and freight transport.

Charakterystyka W2:

Knows the aims and methods of traffic and travel surveys as well as principles of transport systems planning and transport policy.

Charakterystyka W3:

Knows the principles of geometric design of roads, intersections and interchanges, including horizontal and vertical alignment.

Charakterystyka W4:

Knows the basic facts about pavement types, principles of pavement design and methods of

Charakterystyka W5:

Knows the basic facts about railway systems, railroad design and construction.

General academic profile - skils

Charakterystyka U1:

Knows how to conduct selected traffic surveys, analyse survey data, draw conclusions and present the survey results.

Charakterystyka U2:

Knows how to plan transportation facilities in a housing estate, including local roads, car parks, bus bays, footpaths and bicycle paths.

General academic profile - social competences

Charakterystyka K1:

Knows how to work on a project individually and in a team.

Name of course: Fundamentals of Building I

Coordinator of course: Wojciech Terlikowski, dr inż., Ewa Sobczyńska, mgr inż.

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0421

Number of ECTS credits: 4

Number of hours of student's work to achieve learning outcomes:

Total 100 hours= 4 ECTS: Lecture 30 hours, classes 30 hours., project 30 hours, tutorials, defense, exam 10 hours.

Number of ECTS credits on the course with direct participation of academic teacher:

Total 70 hours= 3 ECTS: lecture 30 hours, classes 30 hours, tutorials, defense, exam 10 hours.

Language of course: English

Number of ECTS credits on practical activities on the course:

Total 60 hours= 2,5 ECTS: classes 30 hours, project 30 hours

Form of didactic studies and number of hours per semester:

Lecture:	30h
Project type of course:	30h

Preliminary requirements:

Subject is run with an assumption of students having knowledge from General Mathematics and Physics Subjects.

Purpose of course:

Student is able to recognize basic terminology, definitions and standards from Fundamentals of Building, basic load-bearing systems of construction and their elements, criteria for their selection, loads acting on different building constructions, work of construction systems and their elements, typical technologies used in buildings, general rules for working and finishing activities as well as the materials provided for these stages.

Contents of education:

General terminology, definitions and standards conncected with buildings, formal-low state of rules in Poland and EU , requirements for buildings and building products in frame of low, protection and construction role of the building, loads acting on the building ,spacial stiffness of the building, durability and state of the building, safety of the construction , basic load-bearing systems of constructions and their elements , foundations and settlement of buildings , walls- load-bearing, brick walls, cellular concrete, concrete blocks, partition walls, columns, pillars, rules of joining bricks in the wall, ventilation tracts - fire and smoke, external curtain walls, timber walls , light partition walls- including "dry" building , timber floors, steel-ceramic, reinforced concrete, steel floors.

Methods of evaluation:

During term, students prepare projects : constructional project of the multi-storey building in a typical technology, with architecture and building drawings like cross sections and constructional details. Project should be returned (after min. 3 corrects) no later than on the last meeting before Winter Exams Term. The last mark may be obtained after defense of the perfectly done project. According to the Institute rules, project pass (connected with the defense and getting mark) must be obtained before the next exam zone, sooner than the term when the classes are run. In justified cases, there is a possibility of work continuation, but no longer till the end of March of this year. Lectures are followed by the written exam after IV term, and oral exam if the person responsible for the subject decide to organize it.

Exam: no

Literature:

Skrypty, publikacje: [1] Budownictwo ogólne - W. Żenczykowski; [2] Ustroje budowlane - J. Sieczkowski; [3] Prawo budowlane - Ustawa z dnia 07.07.1994r z późniejszymi zmianami; [4] Warunki techniczne jakim powinny odpowiadać budynki i ich usytuowanie - Rozporządzenie Ministra Infrastruktury z dnia 12.04.2002r z późniejszymi zmianami; [5] Normy budowlane i rozporządzenia.

General academic profile - knowledge

Charakterystyka W1:

Student knows the basic concepts, definitions, regulations regarding the Fundamental of Buildings, knows the basic requirements for buildings, basic types of buildings, their load bearing systems,structural systems, structural elements and design rules . He knows the effects on the building structure, understands how it works. He knows the basic technologies and building materials and rules for the construction and finishing. He knows the rules for implementing the technical documentation using CAD.

General academic profile - skils

Charakterystyka U1:

Student can apply the basic rules of Fundamental of Buildings, recognize and design basic types of buildings, their load bearing systems, structural systems, structural elements. Student can properly select basic technologies and building materials. He can perform technical drawings of construction of a residential building with architectural details using CAD.

General academic profile - social competences

Charakterystyka K1:

Student is able to work independently. Understands the importance of responsibility in engineering activities, including the accuracy of the results of their work and their interpretation. He is able to work independently with literature, is aware of the need for skills development and self-education. Follows the rules of professional ethics. Understands the importance of the principles of sustainable development in construction.

Name of course: Mathematics III - Numerical Methods

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0308

Number of ECTS credits: 3

Number of hours of student's work to achieve learning outcomes:

Total 80 h = 3 ECTS: lectures 15 h; laboratories 30 h; preparation for laboratories and tests 20 h; preparation for the exam and the exam 15 h.

Number of ECTS credits on the course with direct participation of academic teacher:

Total 45 h =1,5 ECTS: lectures 15 h; laboratories 30 h.

Language of course: English

Number of ECTS credits on practical activities on the course:

Total 50 h = 2 ECTS: the presence on laboratories 30 h; preparation to laboratories 20 h.

Form of didactic studies and number of hours per semester:

Lecture:	15h
Laboratory:	30h

Preliminary requirements:

The knowledge of mathematics from first year is demanded to understand lectures and laboratories of numerical methods.

Purpose of course:

Mastery of basic numerical techniques concerning rootfinding for nonlinear equations, interpolations and approximations of functions, numerical integration and approximate solutions of differentials equations. Skill of understanding basic numerical methods. Emphasis on advantages and weaknesses of numerical solutions. Knowledge of theorems concerning convergence of numerical methods. Formation of skills to formulate and write calculation programmes in MATHCAD 2000.

Contents of education:

1. Introduction to the numerical methods. The errors and their estimations. The well-posed problems and the ill-posed problems. The condition number. Stability of numerical algorithms. 2. Rootfinding for nonlinear equations and for systems of nonlinear equations. The bisection method, the secant method, Newton's Method. 3. The polynomial interpolation. The interpolation by splines functions. 4. The method of least squares. The polynomial approximation. The trigonometric approximation. 5. The numerical integration. The simple and the composite trapezoidal quadratures. The simple and the composite Simpson's quadratures. The Gauss-Legendre quadratures. 6. Numerical methods for ordinary differential equations. The approximate solution of the Cauchy problem. The analytical method – the Taylor expansion. The discrete methods: Euler's methods, the Runge-Kutta methods. Laboratory is conducted on the basis of MATHCAD 2000. During laboratory exercises each student learns MATHCAD 2000 and writes, uses and analyses computer programmes, which realize treating numerical methods.

Methods of evaluation:

Obligatory conditions to fulfill: 1. Credit for laboratory achieved by passing two practical tests and three theoretical tests. The maximum number of possibly obtained points is 50 points. The minimum number of points to obtain the credit for laboratory is 26 points. To take an exam a student must have credit for laboratory. 2. Passing a written exam including practical and theoretical problems. The maximum number of possibly obtained points is 50 points. The minimum number of points to pass the exam is 51 points (it is the sum of points obtained for laboratory and the exam).

Exam: yes

Literature:

[1] Atkinson K, E: An Introduction to Numerical Analysis, John Wiley & Sons, 2004. [2] Auxiliary materials accessing on the server K of the Faculty of Civil Engineering (catalog: metnum). [3] Grabarski A., Musiał-Walczak I., Sadkowski W., Smoktunowicz A., Wąsowski J. : Ćwiczenia laboratoryjne z metod numerycznych, OWPW Warszawa 2002.

General academic profile - knowledge

Charakterystyka W1:

He knowns the basic numerical techniques for solving nonlinear equations, interpolations and approximations of functions, numerical calculation of integrals and solving differential equations. He knows the theorems concerning the convergence of numerical methods. He has knowledge about the limitations of these methods.

General academic profile - skils

Charakterystyka U1:

He can do calculations in MathCAD package implementing kwnow numerical methods. Able to assess the mistakes made in calculations.

General academic profile - social competences

Charakterystyka K1:

Student is able to work individually and in teams.

Name of course: Physics II - Experimental Physics

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1050-BU000-ISA-9050

Number of ECTS credits: 2

Number of hours of student's work to achieve learning outcomes:

Total 50 h = 2 ECTS: lab 30 h, self-study 20h.

Number of ECTS credits on the course with direct participation of academic teacher:

Total 30h = 1 ECTS: lab.

Language of course: English

Number of ECTS credits on practical activities on the course:

Total 50h = 2 ECTS: lab 30 h, self-study 20h.

Form of didactic studies and number of hours per semester:

Laboratory: 30h

Preliminary requirements:

Students should be prepared for experiments basing on the instructions containing theoretical introductions to each experiment.

Purpose of course:

Illustration of the lecture Mainstreams of Modern Physics. Performance of the experiment with an application of modern equipment.

Contents of education:

Experiments on: 1. Statistical character of measurements and error evaluation. 2. Investigation of electric D.C. circuits. 3. Measurement of liquids viscosity. 4. Hall Effect in semiconductors. 5.

Investigation of resonance circuit. 6. Ferromagnetism - determination of Curie Temperature. 7. Absorption of gamma radiation in copper and lead. 8. Investigation of dispersion of optical glass.

Methods of evaluation:

The mark for each experiment is based on two elements: 1. Initial oral test; 2. Evaluation of reports based on the qualitative and quantitative analysis of the results.

Exam: yes

Literature:

[1] "Fundamentals of Physics" D. Halliday, R. Resnick, J. Walker. [2] "Feynmans Lectures on Physics", R. Feynman, et. al. [3] "Mechanics" Ch. Kittel. [4] "Electricity and magnetism" Purcell. [5] "Quantum Mechanics" Wichman. [6] "Twentieth Century Physics"- J.Norwood. [7] "Principles of Physics"- M. Nelkon.

General academic profile - knowledge

Charakterystyka W1:

The graduates have knowledge of mathematics and physics enabling them to describe and understand basic phenomena in the field of civil engineering.

Verification: Experiments reports.

Charakterystyka W15:

The graduates have knowledge on the function of information, selection of information sources, techniques of acquiring, storing and distributing information and on elements of multimedia technologies.

Verification: Experiments reports.

Charakterystyka W16:

The graduates have basic knowledge on the protection of intellectual property rights and patent law.

Verification: Experiments reports.

General academic profile - skils

Charakterystyka U1:

The graduates can apply mathematical methods of algebra and calculus for the analysis of basic physical and technical problems, use the rules of mathematical logics, and can use computational methods in engineering calculations.

Verification: Experiments reports.

Charakterystyka U12:

The graduates can describe the observed phenomenon, perform and interpret the results of a simple experiment. They can perform basic tests to identify or estimate the quality of building materials.

Charakterystyka U20:

The graduates have the ability of self-education. They can independently plan their lifelong learning. They are aware of the necessity of improving professional and personal competences. They complement and broaden their knowledge on their own.

Charakterystyka U23:

The graduates can plan and organize work in a team and cooperate with others within the team works. They can determine priorities to help achieve their goals.

General academic profile - social competences

Charakterystyka K1:

The graduates have the ability to understand the importance of responsibility in engineering activity, including accuracy and reliability when presenting and interpreting the results of their own work.

Charakterystyka K2:

The graduates follow the code of professional ethics.

Charakterystyka K7:

The graduates are aware of the recognition of knowledge in solving engineering problems and the need to consult experts in case of difficulties in solving the problem on their own.

Charakterystyka K8:

The graduates are prepared to take care of the achievements and traditions of the engineering profession.

Name of course: Physics III - Building Physics

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0420

Number of ECTS credits: 3

Number of hours of student's work to achieve learning outcomes:

Total 75 h = 3 ECTS: lectures 15h, project 30h, self-study 30h.

Number of ECTS credits on the course with direct participation of academic teacher:

Total 60h = 2,5 ECTS: project 30h, self-study 30h.

Language of course: English

Number of ECTS credits on practical activities on the course:

Total 30 h = 1 ECTS: project.

Form of didactic studies and number of hours per semester:

Lecture:	15h
Project type of course:	30h

Preliminary requirements:

Subject is run with an assumption of students having knowledge from subjects Fundamental of Buildings 1, Fundamental of Buildings 2, Building Materialsm.

Purpose of course:

During the classes students are provided with a basic knowledge and practical skills of Building Physics: evaluating thermal and humid properties of building materials, calculate season heat requirement index, other thermal comfort parameters and basis of architectural acoustics. This knowledge is necessary to study Building Physics II To complete the course students must obtain positive grade in design project and the final exam.

Contents of education:

Base of heat movement; Fourier equations Thermal and humid properties of building materials (heat resistance, factor of heat transmission, thermal distribution, standards and economical requirements) Thermal calculations of partition in constant conditions Calculation of season heat requirement index Thermal Bridges and Corners Thermal comfort, heat absorptivity of the floor Accommodation conditions in winter Accommodation conditions in summer Transparent barriers Humidity in building materials and partitions (air humidity, partial pressure water vapour, cause and kind of dampness) Water vapour diffusion and condensation in building partitions (surface and inside, risk of mould development) Building partitions: principle of draft and execute (walls, floor, roofs).

Methods of evaluation:

During the semester the students execute the practice project. Deadline of devotion calculations connected with thermal protection of buildings (points 1 ? 4) flows away week before winter holiday (Christmas). Students receive final grade from practices after defence faultlessly made project ? not later than before beginning first exam session following after practices. Lectures end with written exam, after which leader can conduct oral exam. To access the exam student must receive positive grade of project practices.

Exam: yes

Literature:

[1] Budownictwo ogólne, W. Żenczykowski. [2] Budownictwo ogólne tom2, Praca zbiorowa Arkady 2005. [3] Polish and European Standards and regulations: PN-EN ISO 6946:1999 PN-B-02025 PN-EN ISO 13788:2002 DzU z 2002 r. nr 75 poz.690 with revision. [4] Ochrona cieplna i charakterystyka energetyczna budynku 2005 L.Laskowski. [5] Ochrona cech energetycznych budynków Poradnik 2005 M. Robakiewicz. Podręcznik fizyki budowli J. Pogorzelski; publikacja w odcinkach w miesięczniku Materiały Budowlane.

General academic profile - knowledge

Charakterystyka W1:

The student knows basic physical phenomena appearing in buildings.

Verification: Design exercises, project defense and exam.

General academic profile - skils

Charakterystyka U1:

The student is able to design building partitions fulfilling specific building requirements and principles of the sustainable development .

General academic profile - social competences

Charakterystyka K1:

The student as a result of the own work is able to put the acquired knowledge into practice.

Name of course: Soil Mechanics and Geotechnical Engineering I

Type of course: Compulsory**Level of education:**

First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0481

Number of ECTS credits: 4

Number of hours of student's work to achieve learning outcomes:

lectures 30; laboratory 30; preparation for laboratory 10; preparation of laboratory reports 10; preparation for exam 20. TOTAL 100 hours = 4 ECTS

Number of ECTS credits on the course with direct participation of academic teacher:

lectures 30; laboratory 30. TOTAL 60 hours = 2,5 ECTS

Language of course: English

Number of ECTS credits on practical activities on the course:

laboratory 30; preparation for laboratory 10; preparation of laboratory reports 10. TOTAL 50 hours = 2 ECTS

Form of didactic studies and number of hours per semester:

Lecture:	30h
Laboratory:	30h

Purpose of course:

Students should possess knowledge about physical and mechanical properties of soils. Students should know the laboratory methods of soils' properties evaluation. They should know how to calculate the stress state in soils due to self-weigth and external loadings.

Contents of education:

LECTURES Classification of soils with regard to their origin as well as physical and mechanical properties. Basic parameters of soil. Determination of soil type and state of subsoil layers. Field sampling of soils for laboratory tests - geotechnical categories and rules according to Eurocode 7. Types of water in a soil mass: adsorbed, capillary and free ground water. Darcy's law, laboratory and field methods of determination of the coefficient of permeability, seepage forces and pore-water pressure. Distribution of stresses in an elastic half-space: Boussinesq's problem solution and methods of estimation of vertical and horizontal stresses due to applied load. Analysis of stresses in subsequent stages of construction: overburden, secondary, additional and total with respect to the global and/or effective stress states. Shear strength of soils: internal friction angle (IFA) and cohesion (C) with theirs apparent and effective values. Stress path and basic laboratory tests: Direct Shear Apparatus (DSA), Triaxial Apparatus (TA). Determination of settlement in case of flexible plate and rigid foundation using modules of compressibility and/or modulus of deformation. Terzaghi's theory of one-dimensional consolidation. PRACTICE: LABORATORY TESTS AND GEOTECHNICAL CALCULATION Determination of physical properties of soils (Report No. 1): Particle-size distribution (sieve test and specimen analysis); Bulk density, skeleton density, porosity, voids ratio, water content, degree of saturation and macroscopic analysis of soil samples; Density index, states of compaction of granular soils; liquidity and consistency indexes due to shrinkage, plasticity, liquidity limits, states of cohesive soils; Coefficient of permeability, active and passive capillary tests. Determination of mechanical properties of soils (Report No. 2): Proctor's compaction test – optimum moisture and respective dry density of soil, degree of fill compaction; Shear strength tests DSA,TA and estimation of IFA and C from the test results; Oedometer test and evaluation of primary compressibility, decompression, and secondary compressibility modulus respectively. Geotechnical calculations – working examples (Written test): Evaluation of permeability of subsoil according to field test of lowering ground water level by controllable well-pumping; Determination of the safety factor for stability of excavation bottom and of inflowing water (flow net, seepage forces); Evaluation of stresses in soil due to applied load (Boussinesq's formulas, Newmark's nomogram, Steinbrenner's method and computational programs); Calculation of settlement of a rigid foundation due to the secondary and additional stresses.

Methods of evaluation:

Defence of the laboratory Reports No. 1 and 2, and written final test dedicated to Geotechnical Calculations. Written and oral exam in case of the lectures.

Exam: yes

Literature:

[1] Das B.M.: Principles of Geotechnical Engineering. Thompson Corp. Ed., Toronto 2007; [2] Jumikis A.: Soil mechanics; Ed. by D. van Nostrad Co., INC Princeton 1962; [3] Kezdi A.: Handbook of Soli Mechanics. Vol.1. Soil Physics. Budapest 1974; [4] Terzaghi K.: Soil Mechanics in Engineering Practice. New York - London 1968; [5] Wiłun Z., Starzewski R:. Soil Mechanics in Foundation Engineering. Vol.1: Properties of Soils. Intertext Books, London 1973.

Name of course: Concrete Structures I

Coordinator of course: Rafał Ostromęcki, PhD

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0451

Number of ECTS credits: 4

Number of hours of student's work to achieve learning outcomes:

Total 105 h = 4 ECTS: lectures 30 h, classes 30 h, preparation to lectures and classes 15 h, preparation of the project 15 h, preparation to colloquia15 h.

Number of ECTS credits on the course with direct participation of academic teacher:

Total 65 h = 2,5 ECTS: lectures 30 h, classes 30 h, consultations and project defense 5 h.

Language of course: English

Number of ECTS credits on practical activities on the course:

Total 45 h = 2 ECTS: preparation to the classes (solving the problems) and work on project preparation 30 h, preparation to colloquia 15 h.

Form of didactic studies and number of hours per semester:

Lecture:	30h
Project type of course:	30h

Preliminary requirements:

There are no formal prerequisites. It is assumed, that students have basic knowledge of building mechanics and materials strength.

Purpose of course:

Introduction to reinforced concrete theory, giving the background for understanding the structures action and ability to conscious design of members. Elaboration of the of multi-storey building project to practise static calculations, cross-setions detailing and structural drawings. Concrete Structures I is the first part of the course and is continued in the sixth semester as Concrete Structures II.

Contents of education:

Lectures: Introduction – the practical use of concrete as building material, idea for reinforced concrete, classification and properties of structural concrete and reinforcing steel. Theory of concrete structures – fundamental assumptions. Theory of phase I and II – equilibrium equations, calculation of stresses in a cross-section at bending, eccentric compression and tension. Theory of phase III (ultimate limit state) – equilibrium equations, capacity of a cross-section and calculation of required reinforcement at bending, eccentric compression and tension. Simplified distribution of stresses in concrete compression zone. Cross-sections with reinforcement in tension and compression zones, design procedures. Introduction to load capacity for transverse force. Tutorial: Learning the fundamentals of reinforced concrete theory by solving example problems - calculation of stresses in phase I and II at bending, calculation of cross-sections capacity and required reinforcement (phase III) at bending and eccentric compression. Project elaboration – explanation of structural system, loading data, static schemes, calculation of internal forces, detailing of

reinforcement, check for serviceability limit state conditions for one-way-spanning slab and secondary beam (rib). Structural drawings explanation. Students are expected to work on individual subjects issued by project supervisor. Project is continued on the sixth semester (design of further superstructure elements).

Methods of evaluation:

1. Lectures: Colloquium organized at the end of semester. 2. Tutorial: Colloquium verifying the understanding of RC cross-section action under selected load cases. Elaboration of a project covering the structural design of a beam-and-slab floor in a multisorey building. Grade for the tutorial is the sum of 50% grade for the colloquium and 50% grade for project. 3. Final grade for the course is 50 % grade for lectures and 50% grade for tutorial. In case of unclear situation final decision is made by teacher on the basis of student's achievements.

Exam: no

Literature:

[1] EN-1990:2007. Eurocode 0: Basis of structural design; [2] EN-1991-1-1:2004. Eurocode 1: Actions on structures – Part 1-1: General actions – Densities, self-weight and imposed loads; [3] EN-1992-1-1:2004. Eurocode 2. Design of concrete structures. Part 1-1: General – Common rules for building and civil engineering structures; [4] Material from lectures and project is enough to get the grade. There are many up-to-date books in English and national languages to be found, regarding the theory and basic design of concrete structures with respect to national practice.

Notes:

Concrete Structures I is the first part of Concrete Structures course, dealing mostly with the theory fundamentals. Continued on the sixth semester focuses more on practical aspects of one-way acting structural elements design.

General academic profile - knowledge

Charakterystyka W1:

The graduates have knowledge of mathematics and physics enabling them to describe and understand basic phenomena in the field of civil engineering. The graduates have knowledge of the fundamentals of dimensioning, construction of structural systems. The graduates have knowledge of the fundamentals of design and analysis of typical general structures. They know the basic standards and guidelines for design of buildings and their elements.

Verification: Colloquium, project

General academic profile - skils

Charakterystyka U1:

The graduates can apply mathematical methods of algebra for the analysis of basic technical problems, use the rules of mathematical logics in engineering calculations. The graduates can classify elements of structural systems. The graduates can define and classify effects on structures. The graduates can design selected structural elements and simple structures. The graduates are expected to be able to apply basic standards in design of structures and their elements.

General academic profile - social competences

Charakterystyka K1:

The graduates have the ability to understand the importance of responsibility in engineering activity, including accuracy and reliability when presenting and interpreting the results of their own work.

Name of course: Metal Structures I

Coordinator of course: Marian Giżejowski, DSc, PhD, C.Eng., Associate Professor

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0461

Number of ECTS credits: 4

Number of hours of student's work to achieve learning outcomes:

Lectures - 30h. Tutorials - 30h. Individual student's work - 25h. Consultations and defense - 5h, Study of lecture notes and preparation to the exam - 10h. Total 100h = 4 ECTS

Number of ECTS credits on the course with direct participation of academic teacher:

Lectures - 30h. Tutorials - 30h. Consultations and defense - 5h, Total 65h = 2.5 ECTS

Language of course: English

Number of ECTS credits on practical activities on the course:

Tutorials - 30h. Individual student's work - 25h. Consultations and defense - 5h, Total 62h = 2.5 ECTS

Form of didactic studies and number of hours per semester:

Lecture:	30h
Project type of course:	30h

Preliminary requirements:

The following courses passed: Building Materials, Building Construction, Strength of Materials.

Purpose of course:

To gain the basic knowledge and practical skills in the following areas: - Steel grade selection for building and civil engineering structures. - Design methods according to limit states philosophy applied to bolted and welded connections as well as to structural members In tension, compression and bending, single and multiple chord compound. - Steelwork detailing.

Contents of education:

1. Textbooks and structural codes. Basic terminology and nomenclature used in metal structures. Requirements for the course. 2. Steel as a structural material, classification and specification requirements according to unified European system, grades, corrosion resistance, quality

requirements, weldability. 3. Limit states method in design of steel structures, reliability index and partial factors. 4. Connections of steel structures, classification of welded connections and connections with mechanical connectors. Connection details and design rules of butt welded connections, construction details and requirements. 5. Connection details and design rules of fillet welded connections, construction details and requirements. 6. Categories of bolted lap connections, connection details and design rules of bearing-resistant and slip-resistant connections, construction details and requirements. 7. Local buckling of sectional plates under compressive direct stresses, plate and section classification system. Calculation of section resistances under simple loading conditions (axial tension, axial compression and pure bending). Classification of web plates, shear resistance of stocky webs. 8. Members under axial tension (cross sections used and design rules). Members under axial compression (cross sections used and design rules with reference to different buckling modes - flexural, torsional and flexural-torsional). 9. Single and compound columns, design of chords and connecting elements (battens and lacing members). Column cap connections. Column bases and elements for holding-down in the foundation. 10. Steel rolled beams simply supported, cross section resistance under combined bending and shear. Design of continuous beams, plastic redistribution of moments, requirements for continuous restraints, lateral and torsional discrete restraints. 11. Lateral-torsional buckling of beams unrestrained between supports or discrete restraints, construction details of lateral supports eliminating lateral-torsional buckling. Steel-concrete composite elements, distortional instability in the beam negative moment regions. 12. Steel plate girders (fabricated on production lines and manufactured for individual customer order). Shaping of plate girder cross section and optimum depth design. 13. Steel plate girder web local buckling under shear stresses, section resistance of slender webs, interactive local buckling. Web local instability under transverse force, flange induced buckling. 14. Selection of web transverse stiffeners, rigid and flexible stiffeners, construction details and requirements. Supports of rolled beams on brick walls, support bearings of plate girders. 15. Constructional drawings and detailing for approval purposes and for fabrication purposes, basic requirements for preparation. Project. Design of steel floor beam system and axially loaded compound two-chord battened column.

Methods of evaluation:

1. At least satisfactory marks for the class-test dealing with connection design and for the submitted design project of steel floor structure and supporting columns. Class-test and project have to be completed within the course semester and their combined mark contributes to the coursework aggregate. 2. Passing the written examination within the examination session with at least the satisfactory mark. 3.Course aggregate is an average mark of two components, namely the coursework aggregate and the examination mark.

Exam: yes

Literature:

[1] MacGINLEY T.J., ANG T.C.: Structural Steelwork. Design to Limit State Theory. 2nd Edition, Butterworth-Heinemann, Oxford 1995. [2] HOGAN T.J., THOMAS I.R.: Design of Structural Connections. 4th Edition, Australian Institute of Steel Construction, Sydney 1994. [3] GARDNER L., NETHERCOT D.A.: Designers Guide to EN 1993-1-1. Eurocode 3: Design of Steel Structures. Thomas Telford, London 2005. [4] JOHNSON R.P., ANDERSON D.: Designers Guide to EN 1994-1-1. Eurocode 4: Design of Composite Steel and Concrete Structures. Thomas Telford, London 2005.

General academic profile - knowledge

Charakterystyka W1:

The student has the basic knowledge on design and shaping of simple steelwork elements - beams, columns, tension members. She/he has the basic knowledge on design and verification of steelwork welded and bolted lap connections.

Verification: Completion of the project and defense, passing the exam.

Charakterystyka W2:

Student has the knowledge on basic structural steel grades for building structures. She/he knows the basic processes of steel production and is able to select a proper steel grade for simple structural elements (beams and columns) and for connectors.

Charakterystyka W3:

Student knows the steelwork design codes in reference to simple structural elements and typical welded and bolted lap connections.

General academic profile - skils

Charakterystyka U1:

Student is able to design simple structural elements (beams, columns). She/he is able to design typical welded and bolted lap connections.

Charakterystyka U2:

Student is able to distinguish steel structures according to the type of their load bearing system, the function, and so on.

Charakterystyka U3:

Student is able to make the constructional drawings of simple structural elements (beams, columns).

Verification:

Preparing constructional drawings for the design project. Defense of the project.

Charakterystyka U4:

Student is able to use appropriate steelwork design codes at the degree required for proper design of simple structural elements as well as welded and bolted lap connections.

Verification:

Submission and defense of the project. Utilization of codes in computational exam problems.

General academic profile - social competences

Charakterystyka K1:

Student takes benefit of lecture materials and presentations as well as, if needed, is prepared to supplement her/his knowledge by studying technical literature.

Verification: Passing the exam.

Charakterystyka K2:

During completion of the tutorial design project, student searches for rational and optimal solutions (referred to selection of sections, grouping of members of the same size, checking the resistance utilization ratios).

Verification: Defense of the project.

Name of course: Mechanics of Structures 1

Coordinator of course: prof. dr hab. inż. Tomasz Lewiński, dr hab. inż. Grzegorz Dzierżanowski, prof. uczelni

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0404

Number of ECTS credits: 4

Number of hours of student's work to achieve learning outcomes:

Calculating hours and ECTS credits: lecture: 30h, in-class meetings: 15h, project tutorials: 15h, self-studying for the tests: 5h, solving homework problems: 10h, self-studying for the exam and taking the exam: 25h, sum: 100 hours=4 ECTS.

Number of ECTS credits on the course with direct participation of academic teacher:

Lecture: 30h, in-class meetings: 15h, project tutorials: 15h, defending homework: 5h, sum: 65 hours=2,5 ECTS.

Language of course: English

Number of ECTS credits on practical activities on the course:

Solving homework problems: 10h; active participating in meetings and tutorials: 30h, defending homework: 5h, repetition before tests and exam: 27h, the sum: 72h=3 ECTS.

Form of didactic studies and number of hours per semester:

Lecture:	30h
Exercise type of course:	15h
Project type of course:	15h

Preliminary requirements:

Matrix equations, including Cramer's systems with square matrices. Elementary skills in mathematical analysis: differentiation and integration of elementary functions. Definite integral. Solving differential equations with constant coefficients. Comprehension of the fundamental laws of theoretical mechanics, concerning equilibrium of plane and spatial bar systems. Elements of theory of elasticity in 3D setting. Equilibrium problem in 3D. Comprehension of the Euler theory of

deformation of straight and in-plane curved bars. Skills in solving the simplest statically determinate equilibrium problems of frames and arches: drawing the graphs of bending moments and transverse shear forces as well as computing selected displacements by Maxwell-Mohr formula. The compulsory completion of the course: Strength of Materials I. The affirmative overall grade for Strength of Materials I is a necessary condition for taking the exam of Mechanics of Structures I.

Purpose of course:

Skills in solving equilibrium problems of arbitrary statically determinate and statically indeterminate plane bar structures: computing stress resultants, displacements and angles of rotation of selected cross sections. Critical assessment of final results and model validation.

Contents of education:

Repetition of the Euler theory of bars. Thermal loadings. Variational form of the equilibrium equations (or the virtual work equation), variational form of the compatibility equations (or the Maxwell-Mohr formula), theorem of Betti. Computing displacements of frames and plane arches. Statics of parabolic arches. Classification of trusses. The Force Method: trusses, frames, plane arches as well as pin-jointed grillages. Computing displacements in statically indeterminate bar structures. The Displacement Method for plane frames made from inextensional bars. The Direct Stiffness Methods for trusses and frames.

Methods of evaluation:

Test 1: checks the skills of solving equilibrium problems of plane frames and arch-frames, by the force method. Test 2: encompasses the displacement method in application to plane frames subject to flexural deformations.Projects : solving exemplary plane frames or arch-frames by the Force Method and the Displacement Method The projects are checked and defended. The written exam comprises two problems to be solved within 120 min. Both problems include computational and theoretical issues. All students are obliged to pass the written exam. The oral exam encompasses the whole material of the subject. The final exam grade encompasses both the written and oral exams. The joint grade is computed as the arithmetic mean from the grades for the tutorials and for the exam.

Exam: yes

Literature:

[1] S. Krenk, J. Hogsberg, Statics and Mechanics of Structures, Springer Science+Business Media, Dordrecht, 2013. (Available as e-book from WUT Main Library)

General academic profile - knowledge

Charakterystyka W1:

Students understand the theory of bars and bar structures, are able to apply the most important methods of solution of static problems of such structures-the force method and the displacement method. They know how to formulate problems of statics of trusses and frames made from inextensible bars under static loads, subject to settlements of supports or subject to thermal loads. Students know the methods based on the reciprocity theorems, Students know the matricial version of the displacement method.

Verification: 2 tests, 2 homework problems along with their defences, the written and oral exams.

General academic profile - skils

Charakterystyka U1:

Students are able to perform a complete static analysis of statically indeterminate bar systems made from straight or curved bars: know how to compute selected displacements or angles of rotation, how to construct the diagrams of stress resultants and reactions in continuous beams and plane frames. Students are able to program the matricial version of the displacement method (in application to statics of trusses and planar frames) on their own

Verification: 2 tests, 2 homework problems along with their defences, the written and oral exams.

Charakterystyka U2:

Students are able to make use of the theory of bar systems; they understand the notions of: displacements, stresses, stress resultants; they know how to write down the equilibrium equations in problems with inextensibility constraints with using the virtual work equation, specified for the problems of trusses and frames. Students understand the Maxwell-Mohr formula which interrelates strain measures and displacements, thus making it possible to compute the latter at given nodes. Students are able to prepare the computational model of bar structures within the ROBOT system and is able to assess critically the results produced by the computer method.

Verification: 2 tests, 2 homework problems along with their defences, the written and oral exams.

Charakterystyka U3:

Students know how to make use of the recommended professional literature and are able to prepare and defend the homework,

Verification: Defence of the homework and observation of students' activity

General academic profile - social competences

Charakterystyka K1:

Students cooperate with each other; they learn how to work together as a team. They understand the importance of the responsibility in the engineering activity and of the professionalism in presenting the results of their work. Student become aware of necessity of accurate and precise analyses of the engineering problems, being informed of consequences of misinterpretations of the structures response.

Name of course: Hydraulics and Hydrology

Coordinator of course: Marek Rudnicki, dr inż.

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0357

Number of ECTS credits: 2

Number of hours of student's work to achieve learning outcomes:

Lectures 15, Design-driven classes 15, Making homework assignment and reporting 12, consultations 1, preparing for two tests 10. Total 53 (2 ECTS).

Number of ECTS credits on the course with direct participation of academic teacher:

Lectures 15, design-driven classes 15, consultations 1 Total 31 (1 ECTS)

Language of course: English

Number of ECTS credits on practical activities on the course:

Making homework assignment and reporting 12, design-driven classes 15, consultations 1. Total 28 (1 ECTS)

Form of didactic studies and number of hours per semester:

Lecture:	15h
Project type of course:	15h

Purpose of course:

Good insight to the concepts, theory and methods of analysis and design of civil engineering hydraulics and engineering fluid mechanics. Understanding of the natural hydrological cycle and ability to analyse and incorporate gauged records of relevant hydrological data into the engineering design.

Contents of education:

Properties of fluids, types of flows, pipe flow, basin, hydrologic cycle, balance of water, open channel flow, probability and statistics in hydrology, river flow, orificies and weirs, culvert hydraulics, bridge hydraulics.

Methods of evaluation:

Three homework assignments. Two 1-hour tests on the hydraulic calculations. Two 1-hour tests on the theory and governing equations.

Literature:

[1] C. Nalluri and R.E. Featherstone, Civil Engineering Hydraulics, 5th edition revised by M. Marriott, Wiley-Blackwell, 2009; [2] L.W.Mays, Ground and Surface Water Hydrology, Wiley and Sons, 2012; [3] S.K.Gupta, Modern Hydrology and Sustainable Water Development; [4] V.T.Chow, Open Channel Hydraulics, McGraw-Hill, New York, 1959; [5] V.T.Chow, D.R.Maidment and L.W.Mays, Applied Hydrology, McGraw-Hill, New York, 1988.

Notes:

Materials are send to the students with the use of USOS, MS Teams or Cloud

General academic profile - knowledge

Charakterystyka W1:

Gain the basic knowledge of hydraulics and hydrology, which is applicable in the design, implementation and maintenance of buildings.

Verification: Tests

General academic profile - skils

Charakterystyka U1:

Can make a simple hydrologic statement, perform hydraulic calculations for pressure pipes and open channels, dimensions of a culvert or bridge.

Verification: 3 homework assignments and 2 tests on hydraulic calculations

General academic profile - social competences

Charakterystyka K1:

Can take responsible decisions affecting the natural environment.

Verification: Relevant problems and questions within the tests and homework assignments

Name of course: Technology and Organization of Building Works II

Coordinator of course: Hubert Anysz, Dr inż.

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0432

Number of ECTS credits: 4

Number of hours of student's work to achieve learning outcomes:

Realizacji projektu (przejrzenie materiałów z wykładu i dodatkowej literatury) 30 godz., ćwiczenia projektowe, wykonanie projektu 60 godz., konsultacje i zaliczenie projektu 10 godz.

Number of ECTS credits on the course with direct participation of academic teacher:

Razem 65 godz. = 2,5 ECTS: ćwiczenia projektowe 60 godz., konsultacje i zaliczenie projektu 5 godz.

Language of course: English

Number of ECTS credits on practical activities on the course:

Razem 90 godz. = 4 ECTS: przygotowanie do realizacji projektu (przejrzenie materiałów z wykładu i dodatkowej literatury)30 godz., ćwiczenia projektowe i wykonanie projektu 60 godz.

Form of didactic studies and number of hours per semester:

Project type of course: 60h

Preliminary requirements:

General knowledge about construction industry and elements of building. All subjects covered by the lectures from previous semester. Passed the exam TOBW I.

Purpose of course:

Student will know theoretical basis for technology and organisation of chosen building Works (after lectures at 4th semester) and practical rules for preparation of technological and organizational Project (after classes at 5th semester).

Contents of education:

PROJECT: preparation of the three Projects, solving problems connected with organisation and technology of: earthworks, concrete works and assembling works.

Methods of evaluation:

Quality of the 3 projects prepared, mark can be lowered for lack of participation in the classes.

Exam: no

Literature:

[1] Dyżewski A. Technologia i organizacja budowy, tom1 i 2. Arkady Warszawa 1989; [2] Lenkiewicz W. Technologia robót budowlanych. PWN, Warszawa 1985; [3] Martinek W., Osiecka E.: Podstawy inżynierii produkcji budowlanej. Oficyna Wydawnicza P.W. Warszawa, 1999; [4] R. Chudley: Building Construction Handbook Wydawca: Butterworth Heinemann, 2006; [5] H. Johnston Bidding & Estimating Procedures Construction Wydawca: Prentice Hall , 2001; [6] R. Chudley Advanced Construction Technology Wydawca: Prentice Hall, 2006; [7] D. Gransberg Construction Equipment Management for Engineers Estimators Wydawca: CRC Press Inc., 2006; [8] R. Barry Construction of Buildings v1 Wydawca: Blackwell Science, 1999; [9] R. Barry Construction of Buildings v2 Wydawca: Blackwell Science, 1999; [10] Allen Fundamentals of Building Construction Materials & Methods 4e Wydawca: John Wiley & Sons, 2004; [11] S. Nunnally Managing Construction Equipment Wydawca: Prentice Hall, 2000.

General academic profile - knowledge

Charakterystyka W1:

The student knows the rules of designing earthworks, reinforced concrete works, and assembling works,

Verification: Defense of 3 technological designs for: earthworks reinforced concrete works assembling works

General academic profile - skils

Charakterystyka U1:

The student can choose the machinery and brigades for earthworks, reinforced concrete works, and assembling works. He/she can design the work execution considering the issue of synchronization of brigades' works. The student can prepare the technological-organization documentation of the construction processes,

Verification: Defense of 3 technological designs for: earthworks reinforced concrete works assembling works

General academic profile - social competences

Charakterystyka K1:

The student can work independently, as well as, in a team. He/she can prioritize the tasks leading to the final result. The student understands the issue of responsibility in the engineers' activities and the issue of reliability of the results achieved and commented. The student realizes the necessity of constant personal and professional development. He/she strives for that.

Verification: Defense of 3 technological designs for: earthworks reinforced concrete works assembling works

Name of course: Basis of Economics

Coordinator of course: dr inż. Jerzy Rosłon

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1180-BU000-ISA-0202

Number of ECTS credits: 2

Number of hours of student's work to achieve learning outcomes:

Total 50 h = 2 ECTS: 30 project, 20 own work.

Number of ECTS credits on the course with direct participation of academic teacher:

Total 30 h = 1 ECTS: design.

Language of course: English

Number of ECTS credits on practical activities on the course:

Total 50 h = 2 ECTS: project 30 h, own work on project 20 h.

Form of didactic studies and number of hours per semester:

Exercise type of course: 30h

Preliminary requirements:

Student should know technology of building works, together with equipment necessary for work performance.

Purpose of course:

Student will know main rules for cost assessment in construction. Basics for preparation of bill of quantities, technical aspects of working time standards preparation, pricing for construction, tools for choosing the most appropriate methods of works from economical point of view. Student will prepare a practical element of the course – he/she will design financial schedule for construction and relevant cost and prices analysis.

Contents of education:

Students will know: - rules for bill of quantities preparation, - rules for estimation of working time and preparation of unit resource use, - methods for cost assessment and unit price estimation, - design of cost for different stadium of the project's documents, - rules for preparation of the financial schedule of the project based on balance sheet estimation.

Methods of evaluation:

Total grade as arithmetical mean for all exercises. Each exercise is graded in the scale from 2 to 5.Grade can be increased for active participation in the classes.Grade can be decreased for delays in exercises preparation.

Exam: no

Literature:

[1] T. Zajączkowska. Kalkulacja kosztorysowa w budownictwie i jej komputerowe wspomaganie. Wydawca: księgarnia budowlana ZAMPEX, Wyd. II., Kraków, 1999; [2] Aktualne przepisy dotyczące kalkulacji kosztów i cen w budownictwie.

General academic profile - knowledge

Charakterystyka W1:

Has knowledge of the principles and methods of cost calculation in construction. Knows the rules of preparing a bill of quantities for construction works. The student knows the methods of technical standardization of work in construction. The student the cost and price calculation methods for construction works. Has knowledge of the principles of selecting economically justified methods of execution of construction works.

Verification: defense of project work, tasks, active participation in classes.

General academic profile - skils

Charakterystyka U1:

The students can prepare cost analyses and price estimations. He/she can prepare a financial schedule

Verification: defense of project work, tasks, active participation in classes.

General academic profile - social competences

Charakterystyka K1:

The student can work independently, as well as, in a team. He/she understands the issue of reliability of presented results. He/she realizes the necessity of constant training.

Verification: defense of project work, tasks, active participation in classes.

Name of course: Sanitary Installations

Coordinator of course: Dr inż. Szymon Firląg

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0904

Number of ECTS credits: 2

Number of hours of student's work to achieve learning outcomes:

Total 50h = 2 ECTS: classes 30h, making homework assignment and reporting 7h consultation of projects 3h, preparing for two tests 10h.

Number of ECTS credits on the course with direct participation of academic teacher:

Total 35h = 1,5 ECTS: classes 30, consultation of projectsand participation in tests 5.

Language of course: English

Number of ECTS credits on practical activities on the course:

Total 40h = 1,5 ECTS: making homework assignment and reporting 10, classes 30.

Form of didactic studies and number of hours per semester:

Exercise type of course: 15h

Project type of course: 15h

Preliminary requirements:

Mainstreams of Modern Physics, Building Physics, Hydraulics and Hydrology.

Purpose of course:

As a result of passing the course the student will get basic knowledge concerning such sanitary installations as: water and sewer, district heating, central heating, ventilation and air-conditioning and exhaust. Students will get acquainted with technical nomenclature, bases of design sanitary installations as well as principles of safe functioning and the exploitation. The knowledge acquired at the course will let students for executing simple designs of sanitary installations, evaluating of existing installations and specifying of their energy effectiveness.

Contents of education:

1. Introduction, history and types of sanitary installations. 2. Water supply and sewer: a. elements of municipal water supply system, b. internal installations: clod and domestic hot water, sewer, c. installation elements, functional and technical characteristics, principles of the design and executions of water systems and sewer systems. 3. Central and district heating: a. basic notions from the scope of the heat exchange and heating, calculation of U-value, disintegration of the temperature in the building compartment, calculation of insulation thickness of freezing deep, b. calculation of heating load, selection of heaters and heat source, types and schemes of central heating systems, regulation and protection of the installation, c. basic notions from the scope of the district heating, heating systems, heating pipelines, heat exchangers und heating substations, compensation. 4. Ventilation, air-conditioning and exhaust: a. basic notions from, calculation ventilation air flow, b. dimensioning and planning of ventilation and air-conditioning systems, appliances, c. energy efficiency of ventilation systems Sanitary installations in low energy and passive buildings.

Methods of evaluation: Written exam, design.

Exam: no

Literature:

[1] Water supply and sewerage / Ernst W. Steel. [2] Design of water supply pipe networks / Prabhata K. Swamee, Ashok K. Sharma. [3] Water supply and sewerage / Terence J. MacGhee. [4] Hot water supply: design and practice / J.J. Barton. [5] Heating and hot water supply: for domestic and other builings / Colin Penn, Donald Soley. [6] Handbook of heating ventilation, and air conditioning / ed. by Jan F. Kreider. [7] Heating, ventilating, and air-conditioning applications: 1995 ASHRAE handbook. [8] District heating / F.B. Turpin. [9] Airconditioning and ventilation of buildings / J. Croome-Gale, Brian M. Roberts.

General academic profile - knowledge

Charakterystyka W1:

Gain the basic knowledge of cold an hot water system, sewage system, ventilation and air-conditioning and heating system.

General academic profile - skils

Charakterystyka U1:

Can make a simple disgn of water system, select raditior and design ventylations system for singel family building.

General academic profile - social competences

Charakterystyka K1:

Can take responsible decisions in professional work.

Name of course: Electrical Installations

Coordinator of course: Arkadiusz Węglarz, dr inż.

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0701

Number of ECTS credits: 1

Number of hours of student's work to achieve learning outcomes:

Total lecture 30 h = 1 ECTS

Number of ECTS credits on the course with direct participation of academic teacher:

Total lecture 30 h = 1 ECTS

Language of course: English

Form of didactic studies and number of hours per semester:

Lecture: 30h

Preliminary requirements:

Calculus, Algebra with Geometry, Mainstreams of Modern Physics, Experimental Physics.

Purpose of course:

Celem głównym przedmiotu jest osiągnięcie przez studenta podstawowych kompetencji dotyczących projektowania, montażu, eksploatacji i utrzymania urządzeń i instalacji elektrycznych w budownictwie z uwzględnieniem różnorodnych aspektów gospodarczych i formalno - prawnych. Zakłada się nabycie wiedzy dotyczącej klasyfikacji instalacji elektrycznych, ich podstawowych funkcji oraz wymagań formalnych wynikających z aktualnego stanu prawnego. Kolejnym celem jest inspirowanie zachowań i postaw pozwalających na oszczędne wytwarzanie, przesył i użytkowanie energii elektrycznej zgodnie z podstawowymi założeniami polityki energetycznej Wspólnoty Europejskiej. Istotnym celem jest również zapoznanie z procedurami przyłączania obiektów do sieci elektroenergetycznych i teletechnicznych oraz uwarunkowaniami wynikającymi z obowiązującego stanu prawnego ze szczególnym uwzględnieniem prawa energetycznego.

Contents of education:

Power supply of commercial facilities: Basic information about the national power system, Principles for power supply of commercial facilities. Power balance principles - calculating the contracted power supply: Calculation of peak power methods - overview, Contracted power supply calculation methods. Main power installations in the construction industry - an overview: Transformer and distribution stations, Power distribution systems, Small power consumer wiring systems. Lighting techniques - rudiments: Theory and principles for designing, Illuminance calculation methods, Light sources and lighting fixtures - an overview, Illuminance measurement. Extra low voltage installations: Classification of elv installations, Automatics installations - an overview, Safety installations in the building - an overview, Interior it networks - telecommunication and computers - an overview. Guidelines for construction and coordination of electrical installations in the construction industry: Construction guidelines for technical rooms and cable ways, Fire protection of cable ways and technical (electrical) rooms, Coordination of cable ways and location of main elements of electrical installations. Guidelines for the design of electrical installations in the construction industry: Scope of the design on the first stages of designing process; Main symbols used in electrical installations designs; Principles for creating plans and schemes of electrical installations. Technical measures ensuring protection for people and devices: Protection measures against the electrical shock, Methods of measurement of the electric shock protection efficiency, Protection measures against atmospheric overvoltages, Methods of measurement of the protection against lightning. Main regulations and standards regarding the electrical installations in the construction industry: Construction law - some regulations, Energy law - some regulations, An overview of compulsory standards and regulations applied to electrical installations, Principles for certification of electrical materials and devices.

Methods of evaluation: Short tests during semester and final test.

Exam: no

Literature:

[1] Markiewicz H.– Instalacje Elektryczne, WNT, wydanie czwarte, 2002 rok; [2] Markiewicz H. – Urządzenia Elektroenergetyczne, WNT, 2001 rok; [3] Niestępski S., Parol M., Pasternakiewicz J., Wiśniewski T. - Instalacje elektryczne. Budowa, projektowanie i eksploatacja, WPW 2001; [4] Petykiewicz P. - Nowoczesna instalacja elektryczna w inteligentnym budynku, COSIW SEP, Warszawa 2001; [5] Praca Zbiorowa – Poradnik Inżyniera Elektryka, tom 1-3, WNT 1999 (wydanie II); [6] W. Dołęga, M. Kobusiński: Projektowanie instalacji elektrycznych w obiektach przemysłowych: zagadnienia wybrane. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2009; [7] Norma PN-IEC 60364 : Instalacje elektryczne w obiektach budowlanych (wybrane arkusze).

Name of course: Architecture and Urban Planning

Coordinator of course: Adam Dolot PhD, Piotr Bujak PhD

Type of course: Compulsory

Level of education: First cycle studies

Programme: Civil Engineering

Group of courses: Obligatory

Code of course: 1080-BU000-ISA-0611

Number of ECTS credits: 3

Number of hours of student's work to achieve learning outcomes:

Together 75 hours = 3 ECTS: Lecture 15 hours, Workshop 30 hours, preparation for workshop 25 hours, consultations 5 hours.

Number of ECTS credits on the course with direct participation of academic teacher:

Together 50 hours = 2 ECTS: Lecture 15 hours, workshop 30 hours, consultations 5 hours.

Language of course: English

Number of ECTS credits on practical activities on the course:

Together 60 hours = 2 ECTS: Workshop 30 hours, preparation for workshop 25 hours, consultations 5 hours.

Form of didactic studies and number of hours per semester:

Lecture:	15h
Project type of course:	30h

Preliminary requirements:

Some knowledge of general building as well as fundamental knowledge of structures of buildings, thermal physics of buildings and building materials is necessary. The ability of making drafts and architectural-building drawings is essential.

Purpose of course:

The programme aims to draw future designing engineers attention to the problems of aesthetics in building. Lectures introduce students to the history of European architecture and the development of engineering structures with special emphasis on the 20th century tendencies. Also, we point out how essential the cooperation between a designing engineer and an architect is during the entire investment process.

Contents of education:

Lectures present problems of architectural design as well as the outline of the history of architecture from ancient times to the present with special emphasis on the architecture of the 20th century. Issues of architectural design are discussed on the example of housing. Workshop classes include designing a basic public service building with a large span structure (e.g. a school gym, a riding facility, a boat workshop, a riverside hostel, etc.). The design sketch must be completed according to the assigned project in the permanent technique in the 1:500 scale; the complete set of other drawings (floor plans, cross sections and elevations) must be completed in the 1:100 scale. A visualisation (axonometry or the perspective drawing) of the designed building is also required.

Methods of evaluation:

1. Lectures are ranked as the written test carried out during the last meeting. 2. Workshops will be considered passed: - after the inspection of the project appointed at the half of the semester has been accepted, - upon submitting the semester project (when accepted by the person conducting individual corrections). • The assessment will be carried out by the entire teaching team.

Exam: no

Literature:

[1] Ernst & Peter Neufert, Architects Data 3rd Edition, Blackwell Publishing Professional 2002; [2] Sir Banister Fletcher, A History of Architecture, Twentieth edition, Arcitectural Press 1998; [3] Michael Fazio, Marian Moffett, Lawrence Wodehouse, A World History of Architecture, Laurence King Publishing 2008; [4] Jan Gympel, The Story of Architecture - from antiquity to the present, Konoeman, 2005; [5] Patrick Nuttgens, Richard Weston, The Complete Handbook of Architecture. From the First Civilizations to the Present Day, Octopus Publishing Group Ltd, 2008; [6] David Watkin, A History of Western Architecture, Laurence King Publishing 2005; [7] Nikolaus Pevsner, An Outline of European Architecture, Penguin Books Ltd; [8] Rozporządzenie ministra infrastruktury z dnia 12 kwietnia 2002 r. w sprawie warunków technicznych jakim powinny odpowiadać budynki i ich usytuowanie, (Dz U Nr 75 z dnia 15 czerwca 2002 r.).

General academic profile - knowledge

Charakterystyka W1:

Posseses elementary knowledge from the field of architectural and urban design and issues concerning design

Verification: Architectural design.

Charakterystyka W2:

Posseses elementary knowledge regarding history of urban planning, architecture and construction

Verification: Lecture exam or test

General academic profile - skils

Charakterystyka U1:

Ability to creatively interpret an architectural and urban design regarding constructional, technological, material and formal solutions.

Verification: Architectural design.

Charakterystyka U2:

Ability to read and interpret an architectural design in realisation.

Verification: Architectural design.

Charakterystyka U3:

Is able to discern the type and character of existing building constuctions realised in different historical periods.

Verification: Lecture exam or test.

General academic profile - social competences

Charakterystyka K1:

Is capable of competent cooperation with an architect during the creative process.

Verification: Architectural design.