Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Analiza obliczeniowa i projektowanie płyt na gruncie
Course name in English	Computational Analysis and Design of Slabs on Ground
Course code	WIL BUD oIIS E15 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	1.00
Semester	3

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
3	8	0	0	0	7	0

3 COURSE OBJECTIVES

Objective 1 Acquiring the ability to use computer methods for modeling building structures

Objective 2 Knowledge of factors, types of loads, types of structures of concrete slabs on ground

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Concrete Structures II, second semester

2 Prestressed and Precast Concrete Structures II, second semester

5 LEARNING OUTCOMES

LO1 Knowledge Student knows the types of loads on concrete pavements and slabs on ground. Student knows the factors affecting the bearing capacity and durability of pavement and slabs on the ground

LO2 Knowledge Student knows computer methods and software of analyzing building structures and knows how to apply them

LO3 Skills Student is able to design and construct a reinforced and prestressed concrete foundation slab, road and airport pavement as well as floor on ground

LO4 Skills Student is able to design repair of an existing slab on ground

6 COURSE CONTENT

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Load types, factors affecting durability and review of structural solutions for concrete slabs on ground	2
L2	Methods for computer modeling of concrete pavements and analysis of obtained results	2
L3	Design and construction of doweled and continuous reinforced concrete pavements	2
L4	Design and construction of prestressed foundation slabs, airport pavements and slab on ground	2

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
P1	Design exercise of post-tensioned airport slab or industrial ground floor	7

7 TEACHING TOOLS

N1 Lecture

N2 Design classes

N3 Consultations

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	15
Consultation hours	0
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	0
Developing results	0
Preparing of reports, projects presentations, discussion	0
Preparing of design exercise	15
Total number of hours devoted to the subject	**30**
Total number of ECTS points	1.00

9 Methods of grading

Partial grades

P1 Final grade in the subject

Summary grade

L1 Individual design exercise and participation in design classes

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1 COURSE INFORMATION

Course name	BIM w modelowaniu infrastruktury
Course name in English	BIM in Infrastructure Modeling
Course code	WIL BUD oIIS E43 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	2.00
Semester	2

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	15	0	0	15	0	0

3 COURSE OBJECTIVES

Objective 1 Presentation of the BIM workflow in the infrastructure modeling on the examples of the dedicated commercial software.

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Basic knowledge of the BIM technology.

2 Basic knowledge of the CAD software.

5 LEARNING OUTCOMES

LO1 Knowledge Basic knowledge of the BIM process in infrastructure modeling including a variety of aiding methods and standards.

LO2 Skills Generation of the digital terrain model (DTM).

LO3 Skills Design and visualization of a simple road segment.

LO4 Social competences Basic knowledge of the collaborative design process.

6 COURSE CONTENT

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Presentation of the BIM in infrastructure workflow on the selected real-life examples.	2
L2	Presentation of the methods for digital terrain model generation.	4
L3	Presentation of the road design process workflow.	6
L4	Presentation of the visualization tools for the infrastructure projects.	3

Computer Laboratory		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
K1	Generation of the digital terrain model.	4
K2	Road design process using BIM technology.	8
K3	Visualization of the infrastructure projects.	3

7 TEACHING TOOLS

N1 Presentations

N2 Computer classes

N3 Collaborative design problems

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	30
Consultation hours	5
Exams and tests during session	5
Hours of autonomous student work	
Preparing for classes, studying literature	10
Developing results	0
Preparing of reports, projects presentations, discussion	10
Total number of hours devoted to the subject	**60**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Test no. 1

F2 Test no. 2

F3 Design problem

Partial grades

P1 Average grade from tests and design (all of the partial grades need to be passing ones)

Summary grade

L1 Passing final grade

Assessment of activity without teacher participation

B1 Evaluation of the design

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Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Diagnostyka techniczna i rewitalizacja budynków istniejących
Course name in English	Building Diagnostics and Revitalization
Course code	WIL BUD oIIS E32 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	1.00
Semester	3

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
3	15	0	0	0	0	0

3 COURSE OBJECTIVES

Objective 1 Course Goal 1. Introduction of the Students with the recipes relating of correct maintenance and the exploitation of building objects

Objective 2 Course Goal 2. The indication of technical and legal possibilities to the leadership of redecorating works and the revitalization of the objects of building and small municipal areas

Objective 3 Course Goal 3. Introduction of the Students with the formality-technical and architectural-constructional problems of the leadership of modernization and the revitalization of objects building

Objective 4 Course Goal 4. Preparation to the in the aspect professionally and responsibility engineer occupation, Pre- paring students for scientific work

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Passing the semester 2

2 The compendium of knowledge from the range of subject: General construction, Building physics, Wooden constructions, Reinforced concrete constructions, Steel constructions, Masonry constructions, Building materials, General Mechanics and Building Mechanics

5 LEARNING OUTCOMES

LO1 Knowledge The student has the knowledges in the range of exploitation, preservation and proper maintenance of objects built

LO2 Knowledge The student be able to estimate the state the technical building; to estimate the degree of the waste of the elements of the building

LO3 Skills The student has the knowledges in the range of the possibility of repair and the leadership of works hugging, modernization and the revitalization of building objects

LO4 Social competences The student is prepared to fulfilling function of the engineer of the building or to work in technical supervision in the individuals of administrative objects

LO5 Social competences The student is conscious the responsibilities of the building engineer occupation in the understanding of the notion "occupation of the public confidence"

6 COURSE CONTENT

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Periodic inspections of building objects - legal bases and requirements; persons authorized to carry out inspections and scope of documentation	2
L2	Professional responsibility of Civil Engineer- the penal, friendly and social responsibility	1
L3	Legal and technical conditions for conducting conservation, modernization and revitalization works - formal bases, co-ordination with the organs of State Administration bodies and rules for preparing documentation	2
L4	The practical principles of the leadership of the technical diagnostics of building objects - the opinion of technical state and the degree of the waste of the element of building and object; the indication of the range of redecorating works in the economic aspect	2

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L5	The indication of the possibility of the revitalization of building objects in the field of architectural and functional range, construction and building, energetistic and installing	5
L6	The indication of the possibility of the revitalization of regions and areas in the field of architecture and urban planning	1
L7	The indication of construction and technical problems near the leadership of the deep revitalization of objects used	2

7 TEACHING TOOLS

N1 Lectures

N2 Multimedia presentations

N3 Discussion

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	15
Consultation hours	0
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	15
Developing results	0
Preparing of reports, projects presentations, discussion	0
Total number of hours devoted to the subject	**30**
Total number of ECTS points	1.00

9 Methods of grading

Partial grades

P1 Test in written form

Summary grade

L1 Positive mark from final test

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Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Dynamika budowli
Course name in English	Dynamics of Structures
Course code	WIL BUD oIIS D15 23/24
Course category	Specialty subjects (profile: Structural Design)
No. of ECTS points	3.00
Semester	2

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	15	0	0	0	15	0

3 COURSE OBJECTIVES

Objective 1 Familiarizing students with modeling dynamic actions on engineering structures and buildings (wind, seismic and paraseimic influences, equipment in buildings); preparing students for scientific work

Objective 2 Familiarizing students with determination of the dynamic response of a structure to dynamic actions.

Objective 3 Familiarizing students with methods of evaluation of the influence of vibrations on buildings and people in buildings.

Objective 4 Familiarizing students with methods of reducing dynamic influences on structures.

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Completed the subject Structural Mechanics II.

5 LEARNING OUTCOMES

LO1 Knowledge Student describes and explains basic concepts concerning dynamic influences on buildings and modeling this influences and knows how to use these concepts in engineering practice and scientific work.

LO2 Skills Student is able to shape dynamic models of structures.

LO3 Knowledge Student describes and explains methods of determining dynamic responses of structure and knows how to use these methods in engineering practice and scientific work.

LO4 Skills Student is able to determine dynamic response of building.

LO5 Knowledge Student describes and explains methods of evaluation of the influence of vibrations on buildings and people in buildings and knows how to use these methods in engineering practice and scientific work. Student also describes and explains methods of reducing this influences.

LO6 Skills Student is able to interpret the results of analysis of the influence of vibrations on buildings and people in buildings.

LO7 Social competences Student is able to o solve the engineering problem and to critically assess the obtained results. Student is responsible for the reliability of his work and he keeps raising his qualifications.

6 COURSE CONTENT

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Basic concepts concerning dynamic actions on buildings.	2
L2	Models of dynamic actions on engineering structures and buildings (wind, seismic and paraseismic influences, equipment in buildings).	6
L3	Determination of dynamic response of structure to dynamic action.	4
L4	Evaluation of the influence of vibrations on buildings and people in buildings.	3

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
P1	Performing analysis of an appointed structure subjected to specified dynamic action using indicated computer program.	15

7 TEACHING TOOLS

N1 Lectures

N2 Projects

N3 Multimedia presentations

N4 Consultations

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	30
Consultation hours	0
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	15
Developing results	0
Preparing of reports, projects presentations, discussion	45
Total number of hours devoted to the subject	**90**
Total number of ECTS points	3.00

9 Methods of grading

Partial grades

F1 Individual project

Partial grades

P1 Written exam

P2 Oral exam

Summary grade

L1 The exam may join students who have completed the design exercises

L2 Final grade of an effect of education is a weighted average of the grades F1, P1 and P2

L3 The prerequisite to positive grading of the subject is to obtain positive assessment of each learning outcome

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1 COURSE INFORMATION

Course name	Komputerowe projektowanie mostów
Course name in English	Computer Aided Design of Bridges
Course code	WIL BUD oIIS E24 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	2.00
Semester	3

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
3	15	0	0	15	0	0

3 COURSE OBJECTIVES

Objective 1 Knowledge of various types of computational models of small, medium and large spans.

Objective 2 Getting to know the methods and mastering the skills to prepare computational models of bridge structures with various structural systems. The acquired knowledge prepares students to solve engineering tasks and to participate in scientific research in the field of bridge mechanics.

Objective 3 Learning the rules and mastering the skills of performing static and dynamic calculations of bridge objects using computer spatial computational models. The acquired knowledge and skills prepares students to solve engineering tasks and to participate in scientific research in the field of bridge mechanics.

Objective 4 Participation in research work carried out at the Division of Bridge, Metal and Timber Structures in the field of mechanics of bridge structures.

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Knowledge of building mechanics

2 Knowledge of principles of construction and design of bridge structures

3 Knowledge of a computer program supporting the development of construction drawings

5 LEARNING OUTCOMES

LO1 Knowledge The student knows the types of computational models of small, medium and large spans bridge structures.

LO2 Knowledge The student knows the ways to prepare computational models of bridge structures with different structural systems.

LO3 Skills The student is able to make a computational model of a bridge object with given parameters and use it to solve engineering tasks and scientific works.

LO4 Social competences The student independently deepens knowledge of computer modeling of bridge structures and is responsible for the reliability and correctness of tasks performed.

6 COURSE CONTENT

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Organizational issues of classes. Basic issues in modeling bridge structures with different structural arrangements.	2
L2	Types of computational models of bridge structures. Areas of application of various types of calculation models. Pros and cons of various types of computational models of the bridge structures.	2
L3	Modeling of concrete, steel and composite bridge structures.	4
L4	Modeling of cable-stayed and suspension bridge structures.	4
L5	Performing static and dynamic analysis of bridge structures using spatial computational models.	3

Computer Laboratory		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
K1	Basic techniques for modeling bridge structures. Preparation of a spatial calculation model of a slab-beam bridge structure. Performing a static analysis of the object.	4
K2	Preparation of the spatial computational model of the truss bridge structure. Performing static and dynamic analysis of the structure (participation in works/analyzes in the field of scientific activity of the Division of Bridge, Metal and Timber Structures).	2
K3	Preparation of the spatial computational model of the arch bridge structure. Performing static and dynamic analysis of the structure (participation in works/analyzes in the field of scientific activity of the Division of Bridge, Metal and Timber Structures).	3
K4	Preparation of the spatial calculation model of the cable-stayed bridge. Performing a static analysis, taking into account pre-tension of the cable stays.	6

7 TEACHING TOOLS

N1 Lectures

N2 Multimedia presentations

N3 Discussion

N4 Design exercises

N5 Consultations

N6 Work in groups

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	30
Consultation hours	2
Exams and tests during session	0
Passing the project	1
Hours of autonomous student work	
Preparing for classes, studying literature	10
Developing results	10
Preparing of reports, projects presentations, discussion	7
Total number of hours devoted to the subject	**60**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Performing laboratory exercises during classes

F2 Performing an individual exercise

Partial grades

P1 Average of forming grades

Summary grade

L1 The average of forming grades minimum 3.0

Assessment of activity without teacher participation

B1 Performing an individual exercise

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1 COURSE INFORMATION

Course name	Komputerowe projektowanie sprężonych konstrukcji betonowych
Course name in English	Computer Based Design of Prestressed Concrete Structures
Course code	WIL BUD oIIS E14 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	2.00
Semester	3

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
3	8	0	0	0	7	0

3 COURSE OBJECTIVES

Objective 1 Preparation to analysis of prestressed concrete structures in the scope of statically indeterminate phenomena with use of computer analysis

Objective 2 Preparation to analysis of prestressed concrete structures in the scope of time-related phenomena with use of computer analysis

Objective 3 Preparation to analysis of prestressed concrete structures built in phases with use of computer analysis

Objective 4 Preparation to scientific work in the scope of prestressed concrete structures

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Required positive results from the previous subjects: Fundamentals of Design and Reliability, Strength of materials II, Structural Mechanics II, Advanced Structural Materials, Concrete structures II, Prestressed and Precast Concrete Elements

5 LEARNING OUTCOMES

LO1 Knowledge Student is aware about rules of advanced analysis of prestressed concrete structures with use of computer calculations

LO2 Skills Student can perform advanced design of prestressed concrete structure with accounting to conditions varying with time

LO3 Social competences Student is aware about responsibility of proper selection of calculation approach in design of extraordinary PC structures

LO4 Knowledge Student knows effects of statis scheme variations on internal forces in PC structures

6 COURSE CONTENT

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
P1	Design of a PC structure built in phases with use of computer approach	7

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Accounting for rheological effects in PC structures with use of computer analysis; reference to the current research directions	3
L2	Construction in stages and its modeling rules	2
L3	Analysis of statically indeterminate PC structures	2
L4	Proper construction of PC members - examples	1

7 TEACHING TOOLS

N1 Lecture

N2 Practical design

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	15
Consultation hours	8
Exams and tests during session	3
Hours of autonomous student work	
Preparing for classes, studying literature	12
Developing results	22
Preparing of reports, projects presentations, discussion	0
Total number of hours devoted to the subject	**60**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Test

F2 Individual/group design work

Partial grades

P1 Weighted final note

Summary grade

L1 Positive result of test

L2 Performing design work

Assessment of activity without teacher participation

B1 Test

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1 COURSE INFORMATION

Course name	Komputerowe wspomaganie projektowania budynków nieskoenergetycznych
Course name in English	Computer Aided Design of Low Energy Building
Course code	WIL BUD oIIS E34 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	2.00
Semester	2

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	15	0	0	15	0	0

3 COURSE OBJECTIVES

Objective 1 To familiarize students with the principles of creating simulation models of hygrothermal phenomena in buildings

Objective 2 To familiarize students with the examples of software for calculation of multidimensional heat transfer and energy balance of buildings

Objective 3 Preparation for scientific work in the field of building physics

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Credits for Building Physics

5 LEARNING OUTCOMES

LO1 Knowledge on the principles of modeling hygrothermal phenomena in buildings, related restrictions and simplifications

LO2 Skills The ability to choose the right calculation tools for the problem being solved.

LO3 Skills Skillful interpretation of results of simulations.

LO4 Social competences Understanding the importance of sustainable development and building influence on natural environment

6 COURSE CONTENT

Computer Laboratory		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
K1	Calculation of homogeneous partition thermal insulation, simulation programs for multidimensional heat flow analysis, analysis of results.	5
K2	Simulation of glazed components.	3
K3	Calculation of the building's heat balance with a monthly step and dynamic simulation software.	4
K4	Individual calculation process related to the diploma thesis.	3

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Review of the basic phenomena and concepts in the field of building physics, methods of balancing energy consumption and requirements in this respect	5
L2	Multidimensional heat flow through building partitions and various simulation approaches	2
L3	Modeling methods and design parameters of the glazed components	3
L4	Building energy balance, principles of designing low-energy buildings, examples of the solutions	3

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L5	Assessment of thermal comfort, quality of the internal environment and the building's impact on the external environment	2

7 TEACHING TOOLS

N1 Lectures

N2 Multimedia presentations

N3 Computational exercise

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	30
Consultation hours	4
Exams and tests during session	5
Hours of autonomous student work	
Preparing for classes, studying literature	0
Developing results	4
Preparing of reports, projects presentations, discussion	8
Total number of hours devoted to the subject	**51**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Grade for exercise

F2 Lecture test

Partial grades

P1 Weighted mean of the grades

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1 COURSE INFORMATION

Course name	Komputerowe wspomaganie projektowania metalowych konstrukcji powierzchniowych
Course name in English	Steel Shell Structures - computer aided design
Course code	WIL BUD oIIS E23 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	2.00
Semester	2

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	15	0	0	0	15	0

3 COURSE OBJECTIVES

Objective 1 Students are introduced to dimensioning, construction and modeling of selected complex steel shell structures

Objective 2 Acquiring knowledge about the construction of connections of complex steel shell structures

Objective 3 Preparing the student to solve engineering tasks and participate in scientific works and research

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 First degree studies in civil engineering

5 LEARNING OUTCOMES

LO1 Skills Student is able to build a numerical model of a complex shell structures

LO2 Skills Student has ability to shape selected spatial shell structures

LO3 Knowledge Student knows the calculation procedures for the dimensioning of shell structures, formulated in European standards and literature

LO4 Social competences Student is able to independently supplement and expand knowledge in the field of shell structures

6 COURSE CONTENT

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Steel and aluminum shell structures - general presentation	1
L2	Structural issues related to the design of liquid and gas tanks	2
L3	Steel silos, loads, shell modeling, support structure	10
L4	Steel containers, loads, computer modeling of the shell, support structure.	1
L8	Issues of fabrication and assembly of metal sheet structures.	1

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
P2	Design of a steel silo based on a shell or beams support structure	15

7 TEACHING TOOLS

N1 Lectures

N2 Projects

N3 Multimedia presentations

N4 Consultations

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	30
Consultation hours	2
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	5
Developing results	15
Preparing of reports, projects presentations, discussion	3
Total number of hours devoted to the subject	**55**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Project

F2 Oral exam

Partial grades

P1 average mark

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1 COURSE INFORMATION

Course name	Komputerowe wspomaganie projektowania metalowych konstrukcji prętowych
Course name in English	Steel Bar Structures - computer aided design
Course code	WIL BUD oIIS E22 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	2.00
Semester	2

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	15	0	0	0	15	0

3 COURSE OBJECTIVES

Objective 1 Familiarize students with types of structures and solutions used in multi-storey steel skeletons

Objective 2 Provide students with knowledge of forming and calculating bars in steel skeletons

Objective 3 Provide students with knowledge of forming and calculating connections and nodes in steel skeletons

Objective 4 Familiarize students with issues concerning research and limit states of steel skeletons. The acquired know- ledge and skills prepare student to solve engineering tasks and research work

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Passed courses from the first degree: strength of materials, structural mechanics

5 LEARNING OUTCOMES

LO1 Knowledge Student knows the types of gravitational and bracing systems, solutions of connections and nodes of steel multistory skeletons

LO2 Knowledge Student knows the method of calculation of skeletons for a given Combination of loads, including the second order effects and imperfections. Student knows the justification of origin of substitute geometric imperfections

LO3 Skills Student is able to perform static calculations and dimensioning of steel bars of a multistoey skeleton

LO4 Social competences Student is ready to work independently and to cooperate in a team on a given task, to formulate and describe the results of her/his own work in a communicative manner. Student is ready to be responsible for the results of work and their interpretation

6 COURSE CONTENT

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Forming of building steel multistory frames	1
L2	Forming and assembly of steel frame bars	1
L3	Design of steel multistory frame joints and nodes	1
L4	Examples of steel multistory building frames	1
L5	Braced and unbraced frames	1
L6	Load configuration, loadcase and load combination	1
L7	Serviceability limit states of steel building multistory frames	1
L8	Ultimate limit states of steel building multistory frames	1
L9	Simplified second order frame analysis	1
L10	Forming and analysis of space multistory framed structure	1
L11	Post-elastic analysis of steel building frames	1
L12	Post-execution columns out-of-plumb	1

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L13	Equivalent initial tilt of steel frames	1
L14	Random equivalent initial bow and tilt in steel frame	2

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
P1	Design of multistory steel skeleton	15

7 TEACHING TOOLS

N1 Lectures

N2 Design exercises

N3 Discussion

N4 Consultations

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	30
Consultation hours	0
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	5
Developing results	20
Preparing of reports, projects presentations, discussion	5
Total number of hours devoted to the subject	**60**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Individual design

Partial grades

P1 Test

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Konstrukcje betonowe specjalne
Course name in English	Special Concrete Structures
Course code	WIL BUD oIIS D17 23/24
Course category	Specialty subjects (profile: Structural Design)
No. of ECTS points	2.00
Semester	2

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	15	0	0	0	15	0

3 COURSE OBJECTIVES

Objective 1 Knowledge and practical dimensioning of selected advanced design problems for Reinforced Concrete (RC)- with elements of preparation for scientific work

Objective 2 Knowledge of engineering modelling of RC structures (hand computations and FEM) including interaction with subsoil - with elements of preparation for scientific work

Objective 3 Shaping of professional responsibility in civil engineering

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Prerequisites: Concrete Structures II

5 LEARNING OUTCOMES

LO1 Knowledge Student knows topics concerning shaping, dimensioning and detailing of RC tanks for liquids including tightness issues - with elements of the latest scientific developments

LO2 Knowledge Student knows Working Stress Theory for bending with tensile axial force in Phases I and II, can compute crack width for such case

LO3 Skills Student can dimension RC rectangular tank for liquid

LO4 Knowledge Student knows topics concerning shaping, dimensioning and detailing of RC silos for granular materials, knows theories of silo pressure - with elements of the latest scientific developments

LO5 Social competences Student is conscious of professional responsibility in structural design and is aware of necessity of continuous upgrade of professional competences

6 COURSE CONTENT

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
P1	Rectangular tank for liquid: preliminary design, load list, FEM model, subsoil model, soil pressure, computations of internal forces (ULS and SLS), wall dimensioning for ULS (bending + tension, bending + compression), crack width computations (SLS, bending + tension), corner detailing, shop drawings for walls	15

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	RC tanks for liquids - circular and rectangular: shaping, statical computations (classical hand computations with tables and FEM), dimensioning and detailing, corner detailing	4
L2	Tightness issues, Working Stress Method for bending and tensile axial force, crack width computations for such case	4
L3	Interaction between RC tank and subsoil, subsoil modelling: Winkler's model, elastic half-space model, FEM	3
L4	Shaping, dimensioning and detailing of RC silos for granular materials, theories of silo pressure	4

7 TEACHING TOOLS

N1 Lectures

N2 Multimedia presentations

N3 Consultations

N4 Design exercises

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	30
Consultation hours	0
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	15
Developing results	0
Preparing of reports, projects presentations, discussion	15
Total number of hours devoted to the subject	**60**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Design assignment

F2 Test

Partial grades

P1 Average of test and design assignment

Summary grade

L1 Positive assessment of design assignment is a necessary condition

L2 test comprises both theoretical issues and design tasks

L3 final grade = average of design assignment + test (50% + 50 %)

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Konstrukcje z betonu i konstrukcje murowe w sytuacjach pożarowych
Course name in English	Concrete and Masonry Structures in Fire Situations
Course code	WIL BUD oIIS E12 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	2.00
Semester	2

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	15	0	0	0	30	0

3 COURSE OBJECTIVES

Objective 1 Introducing the basic terms and definitions as well as determining the requirements connected with design of concrete and masonry structures in fire conditions

Objective 2 Getting familiar with the questions of the influence of fire temperature onto thermal and mechanical properties of concrete and reinforcing steel as well as of masonry elements

Objective 3 Presenting the methods of verification of fire resistance for structural elements (slabs, beams, columns, walls)

Objective 4 Shaping the ability to choose the solutions with respect to structural elements fire resistance and verification of fire resistance for elements

Objective 5 Shaping the structural engineer consciousness with respect to responsibility for executed project within the frame of building fire resistance

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Passing all subjects for semester 1

5 LEARNING OUTCOMES

LO1 Knowledge Student can explain the basic terms connected with design of concrete and masonry structure in fire situation

LO2 Skills Student can define the fire resistance requirements for RC and masonry structural elements

LO3 Knowledge Student can describe and explain the character of changes in thermal and mechanical properties for concrete and reinforcing steel as well as of masonry elements as a function of temperature

LO4 Skills Student can determine the values of material parameters for given level of fire temperature

LO5 Knowledge Student can describe and explain the methods for fire resistance verification for different structural elements

LO6 Skills Student can carry out the verification of fire resistance for selected structural element

6 COURSE CONTENT

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
P1	Determination of fire resistance for selected structural elements made of reinforced concrete and masonry within the range of diploma work.	30

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Basic definitions and terms connected with design of concrete and masonry structures in fire situation. General requirements for structures in fire conditions. Determination of detailed requirements with regard to fire resistance for reinforced concrete and masonry structural elements.	2

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L2	Basis of design for concrete and masonry structures in fire conditions. General methods for identification of values for actions and material properties. Levels of analysis for structure. Fire scenarios for structures. Design procedure - thermal and mechanical analysis. Verification of condition for load-bearing capacity in fire situation..	3
L3	Material properties in fire conditions. Influence of fire temperature onto thermal and mechanical properties of concrete and reinforcing steel as well as of masonry elements.	2
L4	Methods of fire resistance verification for structural elements. Descriptive methods (for different types of structural elements), simplified methods (boundary isotherm method, zone method), fire tests. Ranges of application and limitations for presented methods.	6
L5	High strength concretes (HSC). General characteristic of behavior of HSC - differences in comparison with NSC. Fire resistance verification methods for elements made of HSC.	2

7 TEACHING TOOLS

N1 Lectures / Lectures

N2 Design exercise/ Design workshops

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	45
Consultation hours	0
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	0
Developing results	10
Preparing of reports, projects presentations, discussion	5
Total number of hours devoted to the subject	**60**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Colloquium

F2 Individual project

Partial grades

P1 Average from the forming marks

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Kształtowanie funkcjonalne nowoczesnego budownictwa
Course name in English	Functional Design of Modern Buildings
Course code	WIL BUD oIIS E33 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	3.00
Semester	2 3

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	15	0	0	0	15	0
3	0	0	0	0	15	0

3 COURSE OBJECTIVES

Objective 1 Preparation of materials for futures design diploma work

Objective 2 Preparation for science work

Objective 3 Ability to optimize the interior environment quality

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Fundamentals of Civ. Eng

2 Building Physics

3 Structures: masonry, wooden, concrete prestressed and prefabricated, metal

4 Architectural and Urban Design

5 LEARNING OUTCOMES

LO1 Skills Ability to set up a functional program for the design

LO2 Skills Ability to set up a site plan according to MPZP or WZiZT

LO3 Skills Ability to prepare spatial conceptual design aligned with structural requirements

LO4 Skills Ability to create a building permit design with the complexity required for further diploma work

6 COURSE CONTENT

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
P1	Building permit design	30

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Functional design in buildings	15

7 TEACHING TOOLS

N1 Design exercise

N2 Discussion

N3 Consultations

N4 teamwork

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	45
Consultation hours	0
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	15
Developing results	0
Preparing of reports, projects presentations, discussion	30
Total number of hours devoted to the subject	**90**
Total number of ECTS points	3.00

9 Methods of grading

Partial grades

F1 Individual design

Partial grades

P1 average mark

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Metody statystyczne w projektowaniu konstrukcji
Course name in English	Statistical Methods in Structure Design
Course code	WIL BUD oIIS D13 23/24
Course category	Specialty subjects (profile: Structural Design)
No. of ECTS points	1.00
Semester	2

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	0	0	0	15	0	0

3 COURSE OBJECTIVES

Objective 1 The aim of course is to acquaint the students with knowledge needed for the understanding and use of statistical methods in the design of building structures. The knowledge and skills prepare the student to participate in scientific research.

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Knowledge in mathematics in accordance with the learning outcomes for the 1st cycle studies in Civil Engineering, Faculty of Civil Engineering, CUT.

5 LEARNING OUTCOMES

LO1 Knowledge The student knows and understands the statistical methods used in the analysis of building structures.

LO2 Skills The student can estimate the parameters of the random variable and verify selected statistical hypotheses.

LO3 Skills Student can carry out regression and correlation analysis.

LO4 Skills The student can use simulation methods in the analysis of structures.

LO5 Social competences Student is prepared to work independently and cooperate in a team, describes the results of his work in a communicative way, is responsible for the results of his work and their interpretation.

6 COURSE CONTENT

Computer Laboratory		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
K1	Application of basic statistical definitions and conceptions, analysis of errors and measurement uncertainties.	2
K2	Parameters determination and analysis of probability distribution of random variables.	3
K3	Parameters estimation.	3
K4	Analysis of regression and correlation.	2
K5	Verification of statistical hypotheses.	3
K6	Application of simulation methods.	2

7 TEACHING TOOLS

N1 Computer laboratories

N2 Discussion

N3 Consultations

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	15
Consultation hours	2
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	5
Developing results	3
Preparing of reports, projects presentations, discussion	3
Examination	2
Total number of hours devoted to the subject	**30**
Total number of ECTS points	1.00

9 Methods of grading

Partial grades

F1 Individual project

Partial grades

P1 Oral examination

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Mosty i tunele
Course name in English	Bridges and Tunnels
Course code	WIL BUD oIIS D18 23/24
Course category	Specialty subjects (profile: Structural Design)
No. of ECTS points	2.00
Semester	3

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
3	15	0	0	0	15	0

3 COURSE OBJECTIVES

Objective 1 Knowledge of advanced concepts and modern trends in design of bridges, rehabilitation, repair, and retrofit of existing bridges.

Objective 2 Knowledge of design of long-span bridges - cable-stayed and suspension bridges.

Objective 3 Knowledge of design of steel bridges, composite (steel and concrete) bridges (geometrical properties of the composite section, cross-sectional forces, effects of thermal and rheological loads). Knowledge preparing students to solve engineering tasks as well as to participate in scientific research in the field of bridge mechanics.

Objective 4 Deepening the knowledge of actions and load combinations to EC (development of the static road traffic load models, combination of multi-component actions, development of fatigue load models, actions on footbridges, actions on railway bridges, accidental actions on bridges). Knowledge preparing students to solve engineering tasks as well as to participate in scientific research in the field of bridge mechanics.

Objective 5 Knowledge of classification and various construction techniques of underground structures: road, rail and pedestrian tunnels (cut and cover tunnels both bottom-up and top-down methods, bored tunnels, immersed tube tunnels) and knowledge on various techniques to protect deep excavations

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Bridge structures

2 Concrete and prestressed structures

3 Steel structures

4 Structural mechanics

5 Strength of materials

5 LEARNING OUTCOMES

LO1 Knowledge of advanced concepts and modern trends in design of road and rail bridges, rehabilitation, repair, and retrofit of existing bridge structures

LO2 Knowledge of design and construction of steel bridges, composite bridges and long-span cable-stayed and suspension bridges.

LO3 Knowledge Extended knowledge of actions and load combinations on bridges (actions on railway bridges, fatigue load models, accidental actions on bridges).

LO4 Knowledge of design and construction of underground structures: road, rail and pedestrian tunnels.

LO5 Skills Ability to design a beam deck composite (steel and concrete) bridge to EC (set of conceptual drawings of the bridge; basis of design limit states, combinations of actions, durability, structural analysis; calculations for ultimate limit states and serviceability limit states; detailing of composite (steel and concrete) girder).

6 COURSE CONTENT

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
P1	Organizational issues: discussion of the design task. General information about structural form, communication layout on the bridge and location of the bridge.	2
P2	Setting up the basic parameters of the composite (steel and concrete) bridge: set of conceptual drawings of the superstructure - cross sections and longitudinal sections.	2

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
P3	Actions and combination of actions (non-traffic actions for persistent design situations, traffic loads on road bridges and other when applicable).	3
P4	Detailed structural calculations for main components of the bridge: ultimate limit states (bending, shear, torsion, shear connectors) and serviceability limit states (stress limitation, crack control, deflection control).	6
P5	Detailing of composite (steel and concrete) girder.	2

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Organizational issues: discussion of the topic of classes, objectives and educational outcomes, rules of passing the classes. The aesthetic of bridges - selected issues.	2
L2	Actions and load combinations to EC (development of the static road traffic load models, combination of multi-component actions, fatigue load models, actions on footbridges, actions on railway bridges, accidental actions on bridges)	3
L3	Steel and composite bridges - the concept, configuration and behavior. New trends in the design and construction of composite steel-concrete bridges, double-composite bridges, arch bridges, cable-stayed bridges, suspension bridges.	4
L4	Design and construction of single and multi-span prestressed bridges.	2
L5	Underground structures - road, rail and pedestrian tunnels, construction techniques. Various techniques to protect deep excavations (retaining walls - cantilevered, gravity and anchored walls).	4

7 TEACHING TOOLS

N1 Lectures

N2 Multimedia presentations

N3 Discussion

N4 Design exercises

N5 Consultations

N6 Work in groups

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	30
Consultation hours	2
Exams and tests during session	0
Passing the project	1
Hours of autonomous student work	
Preparing for classes, studying literature	10
Developing results	12
Preparing of reports, projects presentations, discussion	5
Total number of hours devoted to the subject	**60**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Team project

F2 Oral answer

F3 Written final test

Partial grades

P3 Average of forming grades

Summary grade

L1 The average of forming grades minimum 3.0

Assessment of activity without teacher participation

B1 Team project

B2 Oral answer

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Możliwości modernizacji i wzmocnienia budynków
Course name in English	Opportunities for building modernisation and strengthening
Course code	WIL BUD oIIS E13 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	1.00
Semester	2

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	8	0	0	0	7	0

3 COURSE OBJECTIVES

Objective 1 Getting students acquainted with the opportunities for building modernisation and strengthening. The initial preparation for scientific activities in civil engineering.

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 First degree in construction required.

5 LEARNING OUTCOMES

LO1 Social competences Ability to assess the social impact related to the modernization and strengthening of building structures.

LO2 Skills The ability to choose an appropriate way of modernization or strengthening a building structure, depending on different conditions. The ability to prepare a detailed design.

LO3 Knowledge of the computational analysis of existing structures.

LO4 Knowledge of the technology for executing different types of strengthening systems. Knowledge of the principles of modernization or strengthening design.

6 COURSE CONTENT

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Principles of calculation analysis of existing building structures.	2
L2	General rules for the modernization of building structure. Advantages and disadvantages of particular methods of strengthening the structure; selection of an appropriate way of strengthening the structure.	2
L3	Strengthening of the structure by prestressing with unbonded tendons - material requirements, calculations, construction.	2
L4	Characteristics of FRP composite materials. Rules for dimensioning the strengthening in bending, shear or compression of RC elements using FRP.	2

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
P1	The project to adapt the facility to changes in its use (including the strengthening of selected structural elements) made in two variants.	7

7 TEACHING TOOLS

N1 Lectures

N2 Project exercises

N3 Consultations

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	15
Consultation hours	0
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	5
Developing results	0
Preparing of reports, projects presentations, discussion	10
Total number of hours devoted to the subject	**30**
Total number of ECTS points	1.00

9 Methods of grading

Partial grades

F1 The project is implemented in groups of about 3 people.

F2 Active participation in classes

Partial grades

P1 Weighted average of formulating grades

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Projektowanie konstrukcji sprężonych i prefabrykowanych
Course name in English	Design Analysis of Prestressed and Precast Concrete Structures
Course code	WIL BUD oIIS D16 23/24
Course category	Specialty subjects (profile: Structural Design)
No. of ECTS points	2.00
Semester	2

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	15	0	0	0	15	0

3 COURSE OBJECTIVES

Objective 1 Preparation to analysis and design of prestressed concrete structures

Objective 2 Knowledge of concrete structures behavior under long-term loading including influence of time-related effects formulated in codes with account for scientific research

Objective 3 Analysis of prestressing force losses in PC structures.

Objective 4 Preparation to research work in the scope of prestressed concrete

Objective 5 Design and analysis of anchorages zone in post-tensioned structures

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Required positive results from the previous subjects: Fundamentals of Design and Reliability, Strength of materials II, Structural Mechanics II, Advanced Structural Materials, Concrete structures II, Prestressed and Precast Concrete Elements

5 LEARNING OUTCOMES

LO1 Knowledge Student knows the rules of analysis and design of prestressed concrete structures

LO2 Knowledge Student has knowledge of topics related to material properties and time-related effects in calculations of prestressed concrete structures

LO3 Skills Student is able to perform analysis of post-tensioned structural elements

LO4 Skills Student is able to analyses internal forces in statically indeterminate prestressed concrete structures

LO6 Social competences Student is aware about the professional responsibility regarding the design and construction of prestressed concrete structures.

6 COURSE CONTENT

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Losses of prestressing force - advanced information including reference to directions of research works	4
L2	SLS and ULS in prestressed concrete members - general approach	4
L3	Design of specific area in prestressed concrete members: anchorage zone, blisters, cable ducts placing	3
L4	Behavior and design of structures built in phases - basic information	2
L5	Statically indeterminate prestressed concrete structures - internal forces, concordant tendon, analysis	2

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
P1	Design of a prestressed concrete post-tensioned girder	15

7 TEACHING TOOLS

N1 Lectures

N2 Practical design

N3 Discussion

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	30
Consultation hours	5
Exams and tests during session	3
Hours of autonomous student work	
Preparing for classes, studying literature	10
Developing results	0
Preparing of reports, projects presentations, discussion	12
Total number of hours devoted to the subject	**60**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Individual project

F2 Colloquium

Partial grades

P1 Weighted average positive mark

Summary grade

L1 Rating 1

Assessment of activity without teacher participation

B1 Test

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Seminar Dyplomowe - BIM w projektowaniu konstrukcji
Course name in English	Diploma Seminar - BIM in Structural Design
Course code	WIL BUD oIIS E41 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	1.00
Semester	3

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
3	0	0	0	0	0	15

3 COURSE OBJECTIVES

Objective 1 Preparing the student to write the diploma thesis

Objective 2 Gaining practice in preparing and making short presentations

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Basic knowledge and skills related to the use and search of scientific information

5 LEARNING OUTCOMES

LO1 Social competences The student can correctly present information on a given topic in a written form.

LO2 Skills The student is able to effectively use various sources of scientific information.

LO3 Knowledge The student knows basic strategies of preparation for and writing master's thesis.

LO4 Social competences The student can expresses and weight out his own opinions during a discussion on a given topic.

LO5 Skills The student is able to actively use various forms and methods of presenting information. Can communicate clearly and concisely.

LO6 Knowledge The student knows the basic strategies for preparing and delivering presentations.

6 COURSE CONTENT

Seminar		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
S1	Basic principles for conducting scientific research, preparing and publishing their results	1
S2	Principles and stages for preparing the MSc dissertation	2
S3	Scientific information resources - basic principles for searching for information, consolidating query results and usage of	2
S4	Principles for preparing and presenting research results	2
S5	Presentation and discussion of students' own dissertation.	8

7 TEACHING TOOLS

N1 Multimedia presentations

N2 Discussion

N3 Group work

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	15
Consultation hours	0
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	5
Developing results	0
Preparing of reports, projects presentations, discussion	10
Total number of hours devoted to the subject	**30**
Total number of ECTS points	1.00

9 Methods of grading

Partial grades

F1 Oral answers

Partial grades

P1 Oral test

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Seminarium dyplomowe- Konstrukcje żelbetowe, sprężone i murowe
Course name in English	Diploma Seminar - Reinforced Concrete, Prestressed Concrete and Masonry Structures
Course code	WIL BUD oIIS E11 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	1.00
Semester	3

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
3	0	0	0	0	0	15

3 COURSE OBJECTIVES

Objective 1 Learning forms and methods of preparing diploma thesis

Objective 2 Familiarization with methods of collecting materials, methods of analysis and presentation of the results of students' own work. The acquired knowledge and skills prepare students to solve engineering issues and to prepare scientific papers

Objective 3 Shaping of professional responsibility in civil engineering

Objective 4 Ability of dissemination of knowledge pertinent to civil engineering among general public

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Passed 2nd semester, having assigned supervisor of diploma thesis and preliminary topic and title of diploma thesis

5 LEARNING OUTCOMES

LO1 Knowledge Student has additional knowledge (beyond the standard course) pertinent to structural issues in Reinforced Concrete, Prestressed Concrete and Masonry structures

LO2 Skills Student has technical and editing skills needed to prepare diploma thesis and its professional presentation

LO3 Social competences Student is prepared to work independently and to cooperate in team on given task, to formulate and to describe results of their own work in communicative manner

LO4 Social competences Student is conscious of professional responsibility in structural design and is aware of necessity of continuous upgrade of professional competences

6 COURSE CONTENT

Seminar		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
S1	Principles of developing thesis. Diploma procedure. Examples of well and badly written diploma theses	2
S2	Collecting of materials, methods of analysis and presentation of results of own work	2
S3	Students' presentations pertinent to selected structural, dimensioning and detailing problems in Reinforced Concrete, Prestressed Concrete and Masonry structures (beyond the standard course)	6
S4	Students' presentations pertinent to their diploma theses	5

7 TEACHING TOOLS

N1 Consultations

N2 Discussion

N3 Students' own presentations

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	15
Consultation hours	0
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	6
Developing results	0
Preparing of reports, projects presentations, discussion	9
Total number of hours devoted to the subject	**30**
Total number of ECTS points	1.00

9 Methods of grading

Diploma seminar is mostly based on students' own activity and self-prepared presentations

Partial grades

F1 Evaluation of presentation pertinent to selected problems in Reinforced Concrete, Prestressed Concrete and Masonry structures

F2 Evaluation of presentation pertinent to diploma thesis

Partial grades

P1 Evaluation based on two presentations mentioned in formative assessment

Summary grade

L1 Presentation of 2 self-prepared topics - see formative assessment

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Seminarium dyplomowe- Mosty, konstrukcje metalowe i drewniane
Course name in English	Diploma Seminar - Bridge, Metal and Timber Structures
Course code	WIL BUD oIIS E21 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	1.00
Semester	3

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
3	0	0	0	0	0	15

3 COURSE OBJECTIVES

Objective 1 Familiarize students with principles of developing thesis

Objective 2 Familiarize students with diploma procedure

Objective 3 Familiarize students with the methods of collecting materials, methods of analysis and presentation of the results of their own work. The acquired knowledge and skills prepare students to solve engineering problems and to prepare scientific papers

Objective 4 Presentation and constructive criticism of issues analyzed by students as part of their thesis

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Passed semester 2

5 LEARNING OUTCOMES

LO1 Knowledge Student knows the principles of preparing thesis

LO2 Knowledge Student knows the diploma procedure

LO3 Skills Student is able to collect, analyze and present the results of her/his own work

LO4 Social competences Student is ready to work independently and to cooperate in a team on a given task, to formulate and to describe the results of her/his own work in a communicative manner. Student is ready to be responsible for the results of work and their interpretation

6 COURSE CONTENT

Seminar		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
S1	Principles of developing thesis. Diploma procedure. Collecting materials, methods of analysis and presentation of the results of student's own work	1
S2	Presentation of the results of theses prepared by students combined with discussion and constructive criticism by all participants of the seminar regarding the form of presentation, obtained results and directions of further work	14

7 TEACHING TOOLS

N1 Multimedia presentations

N2 Discussion

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	15
Consultation hours	0
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	5
Developing results	5
Preparing of reports, projects presentations, discussion	5
Total number of hours devoted to the subject	**30**
Total number of ECTS points	1.00

9 Methods of grading

Partial grades

F1 Evaluation of the presentation

Partial grades

P1 Activity during classes

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering | Study profile: general academic

Study form: full-time | Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Seminarium dyplomowe- Projektowanie i diagnostyka budynków
Course name in English	Diploma Seminar - Building Design and Diagnostics
Course code	WIL BUD oIIS E31 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	1.00
Semester	3

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
3	0	0	0	0	0	15

3 COURSE OBJECTIVES

Objective 1 Prepare students to write the thesis, present it and collect source materials - the acquired knowledge prepares for scientific and research work

Objective 2 Presentation of scientific and design issues related to the subject of the student's thesis

Objective 3 Familiarize students with graduate exam rules and topics and discussion of selected diploma exam topic

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Passed semester 2

5 LEARNING OUTCOMES

LO1 Knowledge Students have knowledge of selected topics presented during the seminar

LO2 Skills Students have knowledge about the basic elements of scientific and technical publications and methods used in their preparation and are able to prepare their thesis plan, define aims and scope of the work

LO3 Skills Students are able to formulate their own opinions and conclusions about the thesis

LO4 Social competences Students take part in the discussion about their thesis. Students formulate re- marks about own and colleagues work, defend their own views and accept criticism

6 COURSE CONTENT

Seminar		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
S1	Presentation of formal requirements of writing the thesis and description of the main thesis points	2
S2	Presentation of the principles of proper presentation of the diploma thesis	1
S3	Students' presentations of the selected scientific and design topics, related to the scope of their Master degree thesis and discussion.	8
S4	Students presentations of selected elements of their thesis	4

7 TEACHING TOOLS

N1 Discussion

N2 Multimedia presentation

N3 Consultation

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	15
Consultation hours	0
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	8
Developing results	0
Preparing of reports, projects presentations, discussion	7
Total number of hours devoted to the subject	**30**
Total number of ECTS points	1.00

9 Methods of grading

Partial grades

F1 multimedia presentation of selected problem

F2 multimedia presentation of the thesis

Partial grades

P1 Weighted average of all grades

Summary grade

L1 Preparing a presentation of the thesis and selected problem, presence at the seminar, activity during the discussion

Assessment of activity without teacher participation

B1 multimedia presentation of the selected problem

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Seminarium dyplomowe- Projektowanie i diagnostyka budynków
Course name in English	Diploma Seminar - Building Design and Diagnostics
Course code	WIL BUD oIIS E31 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	1.00
Semester	3

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
3	0	0	0	0	0	15

3 COURSE OBJECTIVES

Objective 1 Prepare students to write the thesis, present it and collect source materials - the acquired knowledge prepares for scientific and research work

Objective 2 Presentation of scientific and design issues related to the subject of the student's thesis

Objective 3 Familiarize students with graduate exam rules and topics and discussion of selected diploma exam topic

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Passed semester 2

5 LEARNING OUTCOMES

LO1 Knowledge Students have knowledge of selected topics presented during the seminar

LO2 Skills Students have knowledge about the basic elements of scientific and technical publications and methods used in their preparation and are able to prepare their thesis plan, define aims and scope of the work

LO3 Skills Students are able to formulate their own opinions and conclusions about the thesis

LO4 Social competences Students take part in the discussion about their thesis. Students formulate re- marks about own and colleagues work, defend their own views and accept criticism

6 COURSE CONTENT

Seminar		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
S1	Presentation of formal requirements of writing the thesis and description of the main thesis points	2
S2	Presentation of the principles of proper presentation of the diploma thesis	1
S3	Students' presentations of the selected scientific and design topics, related to the scope of their Master degree thesis and discussion.	8
S4	Students presentations of selected elements of their thesis	4

7 TEACHING TOOLS

N1 Discussion

N2 Multimedia presentation

N3 Consultation

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	15
Consultation hours	0
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	8
Developing results	0
Preparing of reports, projects presentations, discussion	7
Total number of hours devoted to the subject	**30**
Total number of ECTS points	1.00

9 Methods of grading

Partial grades

F1 multimedia presentation of selected problem

F2 multimedia presentation of the thesis

Partial grades

P1 Weighted average of all grades

Summary grade

L1 Preparing a presentation of the thesis and selected problem, presence at the seminar, activity during the discussion

Assessment of activity without teacher participation

B1 multimedia presentation of the selected problem

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering | Study profile: general academic

Study form: full-time | Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Trwałość konstrukcji budowlanych
Course name in English	Durability of Structures
Course code	WIL BUD oIIS D19 23/24
Course category	Specialty subjects (profile: Structural Design)
No. of ECTS points	2.00
Semester	3

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
3	15	0	0	0	0	0

3 COURSE OBJECTIVES

Objective 1 To acquaint students with the corrosion processes of building materials.

Objective 2 To acquaint students with methods of protection against corrosion of building elements.

Objective 3 Comprehension skills of impact of specific environmental conditions to the materials and structure durability.

Objective 4 Preparation for independent collection and evaluation of data from scientific publications serving the de- scription corrosion phenomena of construction materials and to participate in research on durability building construction materials.

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Basic skills in chemistry, technology of building materials and designing of various structures according to curriculum of first and second cycle.

5 LEARNING OUTCOMES

LO1 Knowledge Based on the literature data and the results of scientific research, the student explains the concepts and processes occurring during the destruction of building materials.

LO2 Skills Using scientific tools, the Student is able to describe the processes associated with the corrosion of concrete, steel and building ceramics.

LO3 Knowledge The student is able to assess the degree of aggressiveness of the environment in relation to concrete and steel elements and determine the corrosion exposure classes.

LO4 Skills The student knows the principles of protection of building structures and its material and technological conditions and environmental.

LO5 Social competences The student works in a team to obtain and develop descriptive data process, dynamics and consequences of failure of basic construction materials.

6 COURSE CONTENT

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Durability and sustainability of the structure. General rules for the protection of structures and its material, technological and environmental conditions.	2
L2	Concrete corrosion processes. Steel corrosion processes and reinforcement corrosion in reinforced concrete. Corrosion building ceramics - current scientific reports.	3
L3	Requirements for the durability of reinforced concrete. Classification of aggressive environments in relation to concrete and reinforced concrete.	2
L4	Rules for the protection of reinforced concrete structures (material and structural protection, surface protection). Requirements for surface protection of reinforced concrete structures .	3
L5	Classification of aggressive environments in relation to steel structures. Requirements for steel structures operating in the environment with increased aggressiveness. Protection of steel structures (metal coatings, paintings - general requirements, details solutions).	3
L6	Causes and effects of biological corrosion in construction - current scientific reports.	2

7 TEACHING TOOLS

N1 Lectures

N2 Discussion

N3 Multimedia and oral presentations

N4 Team work

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	15
Consultation hours	5
Exams and tests during session	5
Hours of autonomous student work	
Preparing for classes, studying literature	10
Developing results	0
Preparing of reports, projects presentations, discussion	15
Total number of hours devoted to the subject	**50**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Oral presentation

F2 Active participation in the discussion

Partial grades

P1 Oral presentation/Test

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Ustroje powierzchniowe
Course name in English	Plate and Shell Structures
Course code	WIL BUD oIIS E42 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	2.00
Semester	2

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	15	0	0	0	15	0

3 COURSE OBJECTIVES

Objective 1 Student should get acquainted with mechanical behavior of various types of surface structures.

Objective 2 Student should gain the (basic) ability of numerical analysis of surface structures using FEM.

Objective 3 For some cases of surface structures student should get acquainted with analytical (exact) and approximate solution methods.

Objective 4 Student should be able to understand and comment on the results of numerical calculations.

Objective 5 Student should be prepared to conduct or participate in scientific research.

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Basic knowledge of FEM and continuum mechanics.

5 LEARNING OUTCOMES

LO1 Knowledge Student is able to name the type of surface structure and knows what quantities describe its behavior

LO2 Knowledge Student knows the theory which describes the behavior of the selected surface structure

LO3 Skills Student is able to prepare the numerical model of surface structure **LO4**

Skills Student is able to choose the proper method of structure analysis **LO5 Skills**

Student uses the computer programs to structure analysis

LO6 Skills Student is able to assess critically obtained results of numerical analysis

LO7 Social competences Student is able to formulate conclusions and is aware of her/his responsibility for obtained results

6 COURSE CONTENT

Design exercise		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
P1	Panels - governing equations, numerical analysis (assignment 1)	4
P2	Bending plates - solution of rectangular plate using FDM and tables for engineers (assignment 2)	4
P3	Shells in membrane state - solution of conical shell under self weight and hydrostatic pressure (assignment 3)	4
P4	Shells in membrane-bending state - solution of cylindrical shell (assignment 4)	3

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Equations of an elastic (3D) body. Classification of shell structures.	2
L2	Bending plates.	4

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L3	Analytical and numerical solutions for bending plates.	2
L4	Description of shell geometry. General equations for shells.	2
L5	Shells in membrane state. Shells in membrane-bending state.	4
L6	Modelling of shell structures using FEM.	1

7 TEACHING TOOLS

N1 Lectures

N2 Presentations

N3 Consultations

N4 Discussion

N5 Assignments

N6 Computer calculations

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	30
Consultation hours	4
Exams and tests during session	1
Hours of autonomous student work	
Preparing for classes, studying literature	10
Developing results	10
Preparing of reports, projects presentations, discussion	5
Total number of hours devoted to the subject	**60**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Assignments

Partial grades

P1 Short tests

P2 Final test

Summary grade

L1 Weighted average of points earned in F1, P1, P2

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Wybrane aspekty BIM w projektowaniu konstrukcji
Course name in English	Selected Aspects of BIM in Structure Design
Course code	WIL BUD oIIS D14 23/24
Course category	Specialty subjects (profile: Structural Design)
No. of ECTS points	2.00
Semester	2

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	15	0	0	15	0	0

3 COURSE OBJECTIVES

Objective 1 To provide knowledge related to the basics Building Information Modeling (BIM) technology in design practice.

Objective 2 To educate students on the basics of BIM modeling of structures using dedicated software.

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Basic knowledge of working with MS Windows and CAD software.

2 Passed subject: Computer Methods in Civil Engineering.

5 LEARNING OUTCOMES

LO1 Knowledge The student knows the basics of using BIM technology in design of structures in practice.

LO2 Skills The student can make BIM models of structures in the basic range using dedicated software.

LO3 Skills The student can apply BIM models of structures for performing structural analysis in the basic range using dedicated software.

LO4 Social competences The student can collaborate on making BIM models in the basic range using dedicated software.

6 COURSE CONTENT

Computer Laboratory		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
K1	Modeling of a residential building in Revit. Design development on 3D level.	2
K2	Modeling of a residential building in Revit Architecture. Generating quantity schedules, 2D/3D views and cross-sections. Dimensioning and annotations. Plotting.	2
K3	Structural modeling of a commercial building in Revit Structure: linking CAD file, adding structural components (foundations, walls, beams and slabs).	2
K4	Structural modeling of a commercial building in Revit Structure. Analytical views/analytical models. Modeling loading, point/line/area loading. Hosted loading. Bill of materials, material schedules. Cost schedules.	2
K5	Defining custom object families and their application in modeling.	2
K6	Static analysis of a concrete slab.	2
K7	Terrain modeling/grading, 3D visualizations and renderings. Green modeling: Solar studies. Animations and walkthroughs.	3

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	Building Information Modeling - introduction.	2
L2	BIM tools and parametric modeling.	4

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L3	Interoperability in design processes.	2
L4	BIM-based collaboration in design of structures.	2
L5	BIM for structural engineering.	2
L6	Industrial practice. Summary and outlook.	3

7 TEACHING TOOLS

N1 Lectures

N2 Laboratory sessions

N3 Office hours

N4 Team work

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	30
Consultation hours	4
Exams and tests during session	2
Hours of autonomous student work	
Preparing for classes, studying literature	10
Developing results	0
Preparing of reports, projects presentations, discussion	6
Total number of hours devoted to the subject	**52**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Written test

F2 Project

Partial grades

P1 A weighted average of grades earned in the written test and the laboratory sessions

Summary grade

L1 Attendance at laboratory classes

L2 Written test and laboratory exercise

Assessment of activity without teacher participation

B1 Group project

Tadeusz Kosciuszko Cracow University of Technology

Course Card

Faculty of Civil Engineering

Field of study: Civil Engineering — Study profile: general academic

Study form: full-time — Field of study code: BUD

Study cycle: 2st

Specialty: Structural Design and Management in Civil Engineering (profile: Structural Design)

1 COURSE INFORMATION

Course name	Zarządzanie systemami BIM
Course name in English	Management of BIM Systems
Course code	WIL BUD oIIS E44 23/24
Course category	Subjects Related to Diploma Projects
No. of ECTS points	2.00
Semester	2

2 CLASS TYPE, NUMBER OF HOURS ACCORDING TO THE STUDY PLAN

Semester	Lecture	Class exercise	Laboratory	Laboratory Computer	Design exercise	Seminar
2	15	0	0	15	0	0

3 COURSE OBJECTIVES

Objective 1 Introduction to basic BIM management concepts and basic norm and standards for BIM management like the BS1192 and ISO 19650 series of norms

Objective 2 Making students aware of basic methodologies and principles of managed BIM level 2 processes in engineering practice

Objective 3 Introduction to basic BIM level2 process documents: EIR, BEP, MIDP, TIDP, MPDT and other

Objective 4 A practical exposure of students to collaborative BIM environments, tools and best practices of collaborative work

Objective 5 A practical exposure to coordination and collision detection processes. Development of basic skillsets for BIM Coordinator and BIM manager roles/functions in project

4 PREREQUISITES IN TERMS OF KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 A previous exposure to Introduction to BIM course

2 Practical computer literacy (MS Windows)

3 CAD and BIM software literacy in single-user environments

5 LEARNING OUTCOMES

LO1 Knowledge of fundamental BIM norms, standards and manuals defining collaborative BIM processes on interdisciplinary level. Knowledge of techniques, formats and processes of information-rich BIM models in multidisciplinary design and construction environments

LO2 Knowledge Fundamental knowledge of project governance and BIM management toolsets and skillsets. Intro- duction to defining and managing BIM information processes with BEP, EIR, MPDT, MIDP, TIDP etc. "Best practice BIM" approach.

LO3 Knowledge of principles and tools for BIM coordination and collision detection. Quality of information in BIM models. Coordination models and coordination best practices. Shared coordinates.

LO4 Skills Development of practical skills in collaborative working in BIM. Basic tools, procedures and processes for coordinated teamwork in BIM design teams.

LO5 Skills Development of basic skills for BIM model coordination and collision detection.

LO6 Social competences Development of soft skills and competences for teamwork in BIM environments. Development of new, "collaborative personality", development of model-centric and team-centric mindset.

LO7 Social competences Development of basic competences and profiling of BIM manager and BIM coordinator roles.

6 COURSE CONTENT

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L1	BIM as managed business process. BIM maturity taxonomy according to BSIs B/555 Committee and ISO 19650 standard. BIM process implementation on select international markets (GB, USA, Singapore, Finland, ...). BIM guides and BIM manuals on national levels.	2
L2	BIM level 2 processes according to BS 1192 family of standards. A detailed discussion of BIM management on level 2, Standard Method and Procedure, Roles&Responsibilities, Common Data Environment. Project governance according to PAS 1192-2:2013 specification.	2

Lecture		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
L3	BIM processes according ISO 19650 family of standards, differences and amendments to BS 1192. A detailed discussion of BIM new roles, documents and project management principles. The role of BIM Manager.	2
L4	Container based BIM collaboration. Common Data Environment (CDE) as center for all data/information processes. CDE states/zones: WIP., Shared, Published, Archive. Information quality and information management principles and responsibilities. The role of Information Manager, BIM information protocol.	2
L5	BIM and CAD standards in BIM projects. Naming conventions, version management, suitability codes according to BS 1192:2007 and PAS 1192-2. Specifications for EIR, BEP, MPDT, MIDP, TIDP.	2
L6	BIM coordination. Coordination models, information quality approvals on passages through CDE zones. Best BIM coordination practices. Collision taxonomy and collision resolution procedures. The role of the BIM Coordinator.	2
L7	Open BIM data file formats and standard. Open information exchange in BIM projects. BIM implementation to organizations strategy according to PennState BIM Guide for Owners.	2
L8	Course resume and the test. 1	1

Computer Laboratory		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
K1	Team work in Revit worksharing mode over LAN - configuration and basic principles. Work sets, central model, local models, model detachment. Managing Revit collaborative environments.	2
K2	Tools for teamwork coordination in Revit: CAD and BIM model linking, link management. Simple spatial coordination of BIM models.	2
K3	Tools for teamwork coordination in Revit II: Copy-Monitor in linked models, change management. Coordination review in Revit and collision detection.	2
K4	Shared coordinates in BIM model. Georeferenced terrain models, true north vs. project north. Georeferenced coordination models.	2
K5	Model reviewing, commenting and redlining. Revit support for internal revision management and control. External tools for redlining and commenting. DWF markups exchange format and Design Review software tools to support team-based review and commenting processes.	2

Computer Laboratory		
No.	Subject matter of the course Detailed description of thematic blocks	No. of class hours
K6	Introduction to Navisworks - basic concepts. Navisworks GUI and model navigation tools. Federating BIM and CAD models, models management within the Navisworks environment. Selection sets, search sets, models and modelscomponent visibility states. Saved view management, commenting through NW dedicated file formats (NWD, NFW), model verisfication, markups, measurements. Model sectioning.	2
K7	Collision detection in Navisworks, collision management. Setup of Collicion Detective parameters, Collision Detective workflows and procedures. Collision resolution assignment and verification.	2
K8	Test	1

7 TEACHING TOOLS

N1 Lectures

N2 Laboratory exercises

N3 Group work

N4 Multimedia presentations

N5 Discussion

N6 Consultations

8 STUDENT WORKLOAD

Activity form	Number of hours of activity
Hours realized in contact with the teacher	
Hours resulting from the study plan	30
Consultation hours	5
Exams and tests during session	0
Hours of autonomous student work	
Preparing for classes, studying literature	10
Developing results	0
Preparing of reports, projects presentations, discussion	5
Total number of hours devoted to the subject	**50**
Total number of ECTS points	2.00

9 Methods of grading

Partial grades

F1 Test

F2 Individual project

F3 Group project

Partial grades

P1 Weighted average positive mark

Summary grade

L1 Positive grading of all projects and tests