Introduction to Mechanics in Civil Engineering

Field of study (Kierunek):

Civil Engineering (Budownictwo)

Subject Description Card (Karta Opisu Przedmiotu)

ISCED 2013-F Field of study: Building and civil engineering (code: 0732)

Name of the subject				Subject code		Semester
Introduction to Mechanics in Civil Engineering *Wprowadzenie do Mechaniki w Budownictwie*						**Autumn**
Subject		**Profile**		**Level of education**		
Facultative		**General academic**		**Full-time**		
Type of classes						**ECTS**
Lecture	**Practice**	**Laboratory**	**Project**	**Seminar**	**Exam**	
30	**-**	**-**	**30**	**-**	**YES**	**6**
Faculty conducting subject:	***Faculty of Civil Engineering*** ***Tel: +48 (34) 325 02 06***					
Teachers conducting subject:	***PhD. Eng. Anna Jaskot*** mail: anna.jaskot@pcz.pl ***PhD. Eng. Krzysztof Kuliński*** mail: krzysztof.kulinski@pcz.pl					

I. Card subject	
PURPOSE OF THE SUBJECT	
C01	Students are introduced in the topics concerning the Theoretical Mechanics in Civil Engineering
C02	Mastering by students the ability to prepare schemes of rod structures, identifying statically determinate and indeterminate systems.
C03	Give the students the ability to prepare systems of equilibrium equations, mastering the rules of internal and external reactions calculation in beam, frame and truss systems.
C04	Give the students the ability to solve reactions and forces in spatial systems.
C05	Give the students the ability to determine the center of gravity for planar and spatial geometric shapes.
PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES	
1	Basic knowledge in Engineering Physics
2	Basic knowledge in Engineering Mathematics
LEARNING OUTCOMES:	
Knowledge: the graduate knows and understands	
EK1	Student knows and understands the concepts of Mechanics in Civil Engineering. Understands preparing equilibrium equations and providing equilibrium state for plane and spatial systems. Understands methods of solving internal and external reactions. Knows and understands the basics of determining the center of gravity for planar and spatial geometrical shapes.
Skills: the graduate can	
EK2	calculate reactions in convergent and arbitrary systems. Can determine reactions in simple and complex beams and in planar frames. Student can solve truss system using the joints and Ritter's method. Moreover, student is able to determine the centers of gravity for planar and spatial shapes. He can also solve spatial and arbitrary force systems and spatial systems.
Social competence: the student is ready to	
EK3	work individually and in a team.

PROGRAM CONTENT	
Type of classes - Lecture	**Number of**

		hours
L1	Introduction to basic concepts of Mechanics in Civil Engineering.	2
L2	Models of bodies in Mechanics. Force and its representation. Concepts of Classical Mechanics.	2
L3	Active and passive forces in civil engineering. Types of supports. Degrees of freedom - releases (hinges, telescopes).	2
L4	The equivalence and syntax of work of forces. The concept of the resultant and the balance of forces.	2
L5	Equilibrium of a planar system of forces.	2
L6	Equilibrium of an arbitrary system of forces.	2
L7	Moment of force in relation to a given point.	2
L8	Moment of pair of forces.	2
L9 **L10** **L11**	Analytical and graphical methods for solving truss systems	6
L12	Center of gravity in planar figures and spatial configurations.	2
L13	Introduction to spatial systems.	2
L14	Equilibrium of spatial system of concurrent and arbitrary forces.	2
L15	Final Exam.	2
	TOTAL:	**30**

PROGRAM CONTENT		
Type of classes - Project		**Number of hours**
P1	Introduction to the course. Overview of the credit conditions. Providing list of literature.	2
P2	Assumptions to assignment no. 1 – planar beam. Exemplary complex beam calculations - part I.	2
P3	Exemplary complex beam calculations – part II.	2
P4	Submission of project no. 1 and defense discussion.	2
P5 **P6**	Assumptions to assignment no. 2 – planar frame. Exemplary planar frame calculations.	4
P7	Submission of project no. 2 and defense discussion.	2
P8	Assumptions to assignment no. 3 – planar truss. Planar truss exemplary calculations - part I supporting reactions.	2
P9 **P10**	Planar truss exemplary calculations – part II normal forces in truss rods using the joint method.	4
P11	Verification of obtained results with the Ritter's method in a given cross-section.	2
P12	Submission of project no. 3 and defense discussion.	2
P13	Assumptions to assignment no. 4 – center of gravity of planar geometrical shape.	2
P14	Center of gravity exemplary calculations.	2
P15	Submission of project no. 4 and defense discussion.	2
	TOTAL:	**30**

BASIC AND ADDITIONAL LITERATURE	
Basic literature:	
1.	Khalfallah S., *Structural Analysis 1: Statically Determinate Structures*. Wiley-ISTE 2018.
2.	Hibbeler R. C., *Engineering Mechanics – Statics*. 12th edition, Pearson Prentice Hall, New Jersey 2010.
3.	Beer F. P., Johnston E. R. Jr., Mazurek D. F., Cornwell P. J., Eisenberg E. R.: *Vector mechanics for engineers. Statics and dynamics.* McGraw-Hill, New York 2010.
Additional literature:	
1.	Hibbeler R. C., *Mechanics of Materials*, Pearson, 2017.
2.	McCormac J. C., *Structural Analysis using classical and matrix methods.* John Wiley and Sons Inc. 2007.
3.	Meriam J. L., Kraige L. G., *Engineering Mechanics - Statics*. John Wiley and Sons 2002.