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
Strength of Materials in Civil Engineering *Wytrzymałość materiałów w budownictwie*						**Spring**
Subject		**Profile**		**Level of education**		
Facultative		**General academic**		**Full-time**		
Type of classes						**ECTS**
Lecture	**Practice**	**Laboratory**	**Project**	**Seminar**	**Exam**	
30	**-**	**-**	**30**	**-**	**NO**	**6**
Faculty conducting subject:	***Faculty of Civil Engineering*** ***Tel: +48 (34) 325 09 50***					
Teachers conducting subject:	***PhD. Eng. Anna Jaskot*** mail: anna.jaskot@pcz.pl ***PhD. Eng. Krzysztof Kuliński*** mail: krzysztof.kulinski@pcz.pl ***MSc. Eng. Damian Jończyk*** mail: damian.jonczyk@pcz.pl					

I. Card subject	
PURPOSE OF THE SUBJECT	
C01	A basic understanding of the behavior of common structural forms, based on a physical understanding of how these forms are able to carry external forces through the development of internal forces in structural elements
C02	The ability to derive stress and strain distributions within basic structural members.
PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES	
1	Knowledge in the field of Classical Mechanics
2	Knowledge in the field of Engineering Mathematics (Linear Algebra and Differential Equations)
3	Ability to use structural loading standards.
4	Knowledge of the principles of preparing and reading technical drawings and the ability to apply them, including the preparation of workshop and assembly drawings in the field of steel structures.
LEARNING OUTCOMES:	
Knowledge: the graduate knows and understands	
EK1	conceptual links between structural and solid mechanics, concepts of designing for strength and deformation limits, how beams and frames resist external forces.
Skills: the graduate can	
EK2	determine: the internal forces in statically determinate beams and frames, the stresses within simple elements and cross-sections, deflections in simple beams.
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. Review of Equilibrium	1
L2	Stress and Strain. Mechanical Properties of Materials	1
L3	Axial Load	1
L4	Torsion	1
L5	Constraints and Statical Determinacy	1
L6	Shear Force and Bending Moment Diagrams	1
L7	Moments of Inertia	1
L8	Bending	1
L9	Transverse Shear	1
L10	Deflection of Beams – Elastic Curve	1
L11	Deflection of Beams – Energy Methods	1
L12	Unsymmetric Bending. Combined Loadings	1
L13	Cross-section Core	1
L14	Buckling of Columns	1
L15	Quiz	1
	TOTAL:	**15**

PROGRAM CONTENT		
Type of classes - Practice		**Number of hours**
PT1	Introduction. Review of Forces, Moments	2
PT2	Axial Loading – Statically Determinate Bars	2
PT3	Axial Loading – Statically Indeterminate Problems	2
PT4	Torsion	2
PT5 **PT6**	Shear Force and Bending Moment Diagrams in Beams	4
PT7	Shear Force and Bending Moment Diagrams in Frames	2
PT8	Quiz no.1	2
PT9	Normal and Shear Stresses in Beam	2
PT10 **PT11**	Deflection of Beams	4
PT12	Unsymmetric Bending. Combined Loadings	2
PT13	Cross-section Core	2
PT14	Column Buckling	2
PT15	Quiz no. 2	2
	TOTAL:	**30**

PROGRAM CONTENT		
Type of classes - Project		**Number of hours**
P1	Introduction. General Information about Project	1
P2 **P3**	Review of Statics	2
P4	Project. Individual Assumptions	1
P5 **P6** **P7**	Project. Shear Force and Bending Moment Diagrams	3
P8 **P9**	Project. Normal and Shear Stresses	2
P10 **P11** **P12**	Project. Deflection	3
P13	Project. Cross-section Core	1
P14	Introduction to Structural Design	1
P15	Review	1
	TOTAL:	**15**

BASIC AND ADDITIONAL LITERATURE	
Basic literature:	
1.	Hibbeler R. C., Mechanics of Materials, Pearson, 2017.
2.	Goodno B. J., Gere J. M., Mechanics of Materials, Cengage Learning, 2018.
Additional literature:	
1.	Timoshenko S., Strength of Materials, Part I – Elementary Theory and Problems, D. Van Nostrand Company, 1940.
2.	Gross D., Hauger W., Schröder J., Wall W. A., Bonet J., Engineering Mechanics 2 - Mechanics of Materials, Springer, 2017.
3.	Ghavami P., Mechanics of Materials - An Introduction to Engineering Technology, Springer, 2015.
4.	Dias da Silva V., Mechanics and Strength of Materials, Springer, 2006.
5.	Roylance D., Modules in Mechanics of Materials, <http://web.mit.edu/course/3/3.11/www/module_list.html>.
6.	Bucciarelli L., Engineering Mechanics for Structures <https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-050-solid-mechanics-fall-2004/readings/>.