FACULTY OF CIVIL ENGINEERING

SUBJECT CARD

Name in English:	**Timber structures**
Name in Polish:	**Konstrukcje drewniane**
Main field of study (if applicable):	***Civil Engineering***
Specialization (if applicable):	**Civil Engineering**
Level and form of studies:	**~~1st /~~ 2nd level*, ful-time ~~/ part-time~~***
Kind of subject:	**~~obligatory~~ / optional / ~~university-wide~~***
Subject code:	**CEB006663**
Group of courses:	**YES / ~~NO~~***

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**15**			**15**	
Number of hours of total student workload (CNPS)	**30**			**60**	
Form of crediting	~~Examination~~ / crediting with grade *	Examination / crediting with grade *	Examination~~-~~/ crediting with grade *	~~Examination~~ / crediting with grade *	Examination~~-~~/ crediting with grade *
For group of courses mark (X) final course					
Number of ECTS points	**1**			**2**	
including number of ECTS points for practical (P) classes				**2,0**	
including number of ECTS points for direct teacher-student contact (BK) classes	**0,6**			**0,6**	

* delete as appropriate

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student is able to identify and make a statement loads on components and building structures.
2. The student has knowledge of general mechanics, strength of materials, and general principles of shaping structures.
3. The student knows the rules and the guidelines and codes for the design of buildings and their components.
4. The student has a theoretical basis. He has the ability to calculating and construction elements and basic building structures of concrete, steel, timber and masonry structures.

SUBJECT OBJECTIVES

C1. Knowledge of anatomy of the Wood and rulet of timber grading in terms of the proper use of the structures.

C2. Knowledge of the principles for calculating of solid and complex elements made with solid and glued laminatem timber

C3. Knowledge of the rules for the implementation of connectors for mechanical fasteners, car pentry joints and glued joints. The ability to determine the capacity and vulnerability connectors.

C4.	Knowledge of the principles of protection of timber structures against biological corrosion and fire.

SUBJECT EDUCATIONAL EFFECTS	
Relating to knowledge:	
PEK_W01	Student knows contemporary, modern building materials and he knows the basic elements of manufacturing them.
PEK_W02	Student has expanded knowledge of analysis, design and calculating of timber structures.
Relating to skills:	
PEK_U01	Student can design a modern timber structures, also glulam structures.
PEK_U02	Student can make a graphical project documentation in selected computer program.
Relating to social competences:	
PEK_K01	Student is aware of the need to improve professional and personal skills. student complements and extends knowledge of modern processes and technologies related to civil engineering through formal and informal training
PEK_K02	Student knows and understands the consequences of non-technical aspects and engineering activities. Sstudent understands the impact of these decisions on the environment and he understands the responsibility for decisions.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec1	Examples of historical and contemporary objects made of timber. General discussion of the problems of design of timber structures	2
Lec2	Anatomy of the wood, the effect of anisotropy on the physical and mechanical properties of the material. Natural characteristics of wood and defects.. Specifying the basic mechanical properties. Customary target sizes of structural timber. Principles of visual and machine grading of wood, the grading class and strength class. Engineered wood products - the types and properties.	3
Lec3	Design of timber structures according to the PN-EN 1995. General rules, ultimate limit states, serviceability limit state, the basis of structural analysis.	2
Lec4	Connectors in timber structures. Joints timber-timber, plate- timber, steel-timber by using nails, screws, bolts, dowels, split-rings connectors, toothed-plates connectors, nail plates.	2
Lec5	The bases for calculating the fire resistance according to EN 1995. The requirements for fire resistance. The effect of interaction in case of fire. Methods for calculating the load capacity.	2
Lec6	Glued laminated timber. The parameters of the material, production, technology, connection details. Examples of applications.	2
Lec7	Historic timber structures. Biological corrosion in timber structures. Wood insects and wood-destroying fungi.	2
	Total hours	**15**

Form of classes - class		**Number of hours**
Cl1		
...		
	Total hours	

Form of classes - laboratory		**Number of hours**
Lab1		
…		

	Total hours	

Form of classes - project		**Number of hours**
Proj1	Explanation of the examination. Set a schedule of classes and transitional periods. General introduction to the design of timber structures. Deal subjects design classes.	2
Proj2	Explanation of the project no. 1 Beams made with the use of mechanical fasteners.	2
Proj3	Explanation of the project no. 1 Spaced columns with packs or gussets and lattice columns	2
Proj4	Explanation of the project no. 2 Design rules for joint in timber structures by using dowel type fasteners, toothed-plates connectors and nail plates.	2
Proj5	Explanation of the project no. 3 Glued laminated timber beams. calculation of tapered, double tapered, curved and pitched cambered beams.	2
Proj6	Explanation of the project no. 3 Load capacity of glulam elements in case of fire.	2
Proj7	Pass classes on the basis of completed projects	3
	Total hours	**15**

Form of classes - seminar		**Number of hours**
Sem1		
…		
	Total hours	

TEACHING TOOLS USED
N1. Lecture: multimedia presentations N2. Project: presentation of selected computer-aided design software

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1 (project)	PEK_U01, PEK_U02 PEK_K02	project
F2 (project)	PEK_W02, PEK_U01.	test
F3		
P = 0.4×F1 + 0.5×F2 + 0.1× presence (project)		
P (lecture)	PEK_W01, PEK_W02 PEK_K01	test

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE:
[1] Buczkowski W. i in. (2009) Budownictwo ogólne. Tom 4 – Konstrukcje budynków. Arkady, Warszawa.
[2] Kotwica J. (2011) Konstrukcje drewniane w budownictwie tradycyjnym. Arkady, Warszawa.
[3] Mielczarek Z. (1994) Budownictwo drewniane. Arkady, Warszawa.

[4] Neuhaus H. (2008) Budownictwo drewniane. Polskie Wydawnictwo Techniczne, Rzeszów.
[5] Nożyński W. (2001) Przykłady obliczeń konstrukcji budowlanych z drewna. WSiP, Warszawa.
[6] Porteous J., Kermani A. (2007) Structural Timber design to Eurocode 5. Blackwell Publishing, Oxford.
[7] Stefańczyk B. i in. (2007) Budownictwo ogólne. Tom 1 - Materiały i wyroby budowlane. Arkady, Warszawa.
[8] Standards:
PN-EN 1995-1-1:2010. Eurokod 5: Projektowanie konstrukcji drewnianych. Część 1-1: Postanowienia ogólne. Reguły ogólne i reguły dotyczące budynków.
PN-EN 1995-1-2:2008. Eurokod 5: Projektowanie konstrukcji drewnianych. Część 1-2: Postanowienia ogólne. Projektowanie konstrukcji z uwagi na warunki pożarowe.
PN-EN 1194:2000. Konstrukcje drewniane. Drewno klejone warstwowo. Klasy wytrzymałości i określenie wartości charakterystycznych.
PN-EN 338:2011. Drewno konstrukcyjne. Klasy wytrzymałości.
PN-B-01042:1999. Rysunek konstrukcyjny budowlany. Konstrukcje drewniane.

SECONDARY LITERATURE:

[1] Becker K., Blass H. (2006) Ingenieurholzbau nach DIN 1052. Einführung mit Beispielen. Ernst&Sohn, Berlin.
[2] Erler K. (2004) Alte Holzbauwerke: beurteilen und sanieren. Huss-Medien Verlag Bauwesen, Berlin.
[3] Herzog T., Natterer J., Schweitzer R. i in. (2003) Holzbau Atlas. Birkhäuser, Edition Detail, München.
[4] Jasieńko J. (2003) Połączenia klejowe i inżynierskie w naprawie, konserwacji i wzmacnianiu zabytkowych konstrukcji drewnianych. DWE, Wrocław.
[5] Larsen H., Enjily V. (2009) Practical Design of Timber Structures to Eurocode 5. Thomas Telford, London
[6] Mönck W., Rug W. (2008) Holzbau. Bemessung und Konstruktion.. Verlag Bauwesen, Berlin
Thelandersson S., Larsen H.J., Ed. (2003) Timber Engineering. Wiley&Sons, London.

SUBJECT SUPERVISOR (NAME AND SURNAME, DIVISION, E-MAIL ADDRESS)

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MEMBERS OF TEH EDUCATIONAL TEAM (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Timber structures
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY ***Civil Engineering***
AND SPECIALIZATION **Civil Engineering**

Subject educational effect	**Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)****	**Subject objectives *****	**Programme content *****	**Teaching tool number *****
Knowledge				
PEK_W01	K2_W10	C1,C4	Lec2,Lec,Lec6	N1
PEK_W02	K2_W05, K2_W06, K2S_CEB_W22	C1,C2,C3,C4	Lec1 – Lec7	N1
Skills				
PEK_U01	K2_U04, K2_U05, K2_U07, K2S_CEB_U23	C2,C3,C4	Proj1 – Proj7	N2
PEK_U02	K2_U12	C2,C3	Proj1 – Proj7	N2
Social competences				
PEK_K01	K2_K01	C1,C2,C3,C4	Lec1 – Lec3, Lec7	N1
PEK_K02	K2_K02	C1,C4	Lec1 – Lec3, Lec7	N1

** - enter symbols for main-field-of-study/specialization educational effects
*** - from table above