COURSE DESCRIPTION CARD - SYLLABUS

Course name
Timber structures [S1BZ1E>KD]

Course

Field of study
Sustainable Building Engineering

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
15

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

KNOWLEDGE: The student has the knowledge in the fields of mathematics, physics, chemistry, strenght of materials and building mechanics. SKILLS: The student is able to obtain information from literature, databases and other properly selected information sources; can integrate the obtained information, interpret and evaluate it, as well as draw conclusions, formulate, discuss and justify opinions SOCIAL COMPETENCE: The student takes responsibility for the accuracy and reliability of working results and their interpretation; can realise that it is necessary to improve professional and personal competence.

Course objective

The aim of the course is to familiarize students with the following topics: anatomical structure of wood, mechanical and physical properties of timber, carpentry joints, mechanical fasteners, design methods of joints, design methods of timber elements, beam structures and roof truss structures.

Course-related learning outcomes

Knowledge:
1. The student knows building legislation, Polish standards (PN) and European standards (EN), technical conditions of constructing building facilities.

2. The student knows the principles of constructing and dimensioning timber elements as well as connections of building units
3. The student has knowledge of: timber and timber properties, research methods, basic elements of their design, performance and assembly technologies, methods for evaluation and maintenance of structure technical condition.

Skills:
1. The student can classify building facilities and elements of technical fitting of buildings.
2. The student is able to design selected timber elements.
3. The student is able to perform the analysis of linear stability and ultimate limit capacity of simple timber bar structures, in the aspect of evaluating critical and ultimate limit states.
4. The student is able to interpret architectural, building, installation and geodesic drawings; to prepare graphic documentation in traditional way, and in the environment of selected CAD software (including the BIM technology).
5. The student can communicate in a foreign language (also other than English), including technical terminology in the field of sustainable building engineering.
6. The student is equipped with various skills necessary for performing design tasks in the form of particular works in the field of sustainable building engineering, including such skills as: traditional techniques (freehand drawing), specialized software dedicated for design (CAD and BIM technology).

Social competences:
1. The student takes responsibility for the accuracy and reliability of working results and their interpretation.
2. The student is able to critically evaluate the results of his own work

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Knowledge acquired during lectures is verified during a written exam consisting of variously scored questions (test and/or open).
Knowledge acquired during the tutorials is verified during a written colloquium.
Knowledge acquired during the design exercises is verified during execution of a project and its defence.
The basic evaluation criterion is obtaining the right amount of points. Passing threshold above 50% of points. Grading scale:
between 90 - 100 % points - very good (A)
between 80 - 90 % points - good plus (B)
between 70 - 80 % points - good (C)
between 60 - 70 % points - sufficient plus (D)
between 50 - 60 % points - sufficient (E)
below 50 % points - insufficient (F)

Programme content

Characteristics of wood as a building material (timber). Anatomical structure, elastic and strength properties of wood. The effect of humidity and temperature on wood/timber properties. Protection of timber structures against biological corrosion and fire. Carpentry joints. Mechanical fasteners (nails, bolts, screws, screws, nail plates, toothed rings). Design methods of joints in timber structures. Design methods of timber structures. Ultmate and serviceability limit states. Capacity and stability of timber structures. Beam structures and roof truss structues.

Course topics

Characteristics of wood as a building material (timber). Anatomical structure, elastic and strength properties of wood. The effect of humidity and temperature on wood/timber properties. Protection of timber structures against biological corrosion and fire. Carpentry joints. Mechanical fasteners (nails, bolts, screws, screws, nail plates, toothed rings). Design methods of joints in timber structures. Design methods of timber structures. Ultmate and serviceability limit states. Capacity and stability of timber structures. Beam structures and roof truss structues.

Teaching methods

Lecture: informative lecture, problem lecture, demonstration
Exercises: exercise method (subject exercises, practice)
Projects: project and demonstration method

Bibliography

Basic
1. EN 1995-1-1 Eurocode 5: Design of timber structures. Part 1-1: General. Common rules and rules for buildings.
2. EN 1995-1-2 Eurocode 5: Design of timber structures. Part 1-2: General. Structural fire design.
3. EN 1995-2 Eurocode 5: Design of timber structures. Part 2: Bridges.
4. H.J. Larsen and V. Enjily, Practical Design of Timber Structures to Eurocode 5, Thomas Telford Ltd, p. 280, 2009.
5. J. Porteous and P. Ross, Designers" Guide to Eurocode 5: Design of Timber Buildings, ICE Publishing, p. 220, 2013.
6. J. Porteous, A. Kermani, Structural Timber Design to Eurocode 5, 2nd Edition, Wiley-Blackwell, p. 640, 2013.
Additional
1. M. Szumigała, M. Chybiński, Ł. Polus, Preliminary analysis of the aluminium-timber composite beams, Civil and Environmental Engineering Reports 27 (4): 131-141, 2017.
2. M. Szumigała, E. Szumigała, Ł. Polus, An analysis of the load-bearing capacity of timber-concrete composite beams with profiled sheeting, Civil and Environmental Engineering Reports 27 (4): 143-156, 2017.
3. PN-EN 1995-1-1 Eurokod 5: Projektowanie konstrukcji drewnianych. Część 1-1: Postanowienia ogólne. Reguły ogólne i reguły dotyczące budynków.
4. PN-EN 1995-1-2 Eurokod 5: Projektowanie konstrukcji drewnianych. Część 1-2: Postanowienia ogólne. Projektowanie konstrukcji z uwagi na warunki pożarowe.
5. PN-EN 1995-2 Eurokod 5: Projektowanie konstrukcji drewnianych. Część 2: Mosty.
6. E. I. Kotwica, W. Nożyński, Konstrukcje drewniane – przykłady obliczeń, Stowarzyszenie Producentów Płyt Drewnopochodnych w Polsce, Szczecin 2015
7. Z. Lis, P. Rapp: Drewno i materiały drewnopochodne. Rozdział 10 w: Budownictwo ogólne, tom I, Arkady, Warszawa 2005, 2006.
8. H. Neuhaus: Budownictwo drewniane. Polskie Wydawnictwo Techniczne, Rzeszów 2004.
9. J. Kotwica: Konstrukcje drewniane w budownictwie tradycyjnym. Arkady, Warszawa 2004.
10. Cz. Wajdzik: Więźby dachowe. Wyd. Akad. Roln. we Wrocławiu, Wrocław 2001.
11. W. Nożyński: Przykłady obliczeń konstrukcji budowlanych z drewna. Wyd. 2. WSiP, Warszawa 2004.
12. H. Zobel, T. Alkhafaji: Mosty drewniane. Wydawnictwa Komunikacji i Łączności, Warszawa 2006.
13. W. Michniewicz: Konstrukcje drewniane. Arkady, Warszawa 1958.
14. Dziarnowski Z., Michniewicz W., Konstrukcje z drewna i materiałów drewnopochodnych, Arkady, Warszawa, 1974
15. Gołębiowski Z., Konstrukcje drewniane, PWN, Warszawa, 1978
16. M. Chybiński, Ł. Polus, Theoretical, experimental and numerical study of aluminium-timber composite beams with screwed connections, Construction and Building Materials 226: 317-330, 2019.
17. M. Szumigała, Ł. Polus, Finite element modelling of the connection for timber-concrete composite beams, IOP Conference Series: Materials Science and Engineering 471, Article number: 052081, 2019.
18. M. Chybiński, Ł. Polus, W. Szwabiński, P. Niewiem, [w:] Computational Technologies in Engineering, P. Baranowski, P, Kędzierski, A. Szurgott (red.), FE Analysis of Steel-Timber Composite Beams, AIP Publishing, 020061-1 - 020061-6, 2019.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	4,00
Classes requiring direct contact with the teacher	60	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	65	2,00