



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Structural engineering

Course

Field of study

Environmental Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

2/III

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

Tutorials

Projects/seminars

30

Other (e.g. online)

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

Dr inż. Mariusz Gaczek

Responsible for the course/lecturer:

Dr inż. Ewa Oleszkiewicz

Prerequisites

Basis of mathematics; basic knowledge of the Windows operating system and the EXCEL spreadsheet; ability to acquire information from designated sources; ability to cooperate in a team.

Course objective

To acquire basic knowledge and skills to solve selected tasks in the field of mechanics and strength of materials. Knowledge of basic building materials and the rules of their use, getting to know the structural components and load-bearing systems of buildings, as well as the selected civil engineering structures, getting acquainted with the process of architectural and structural design.

Course-related learning outcomes

Knowledge

The student knows: 1) basic concepts of the strength of materials, 2) methods of determining internal forces in planar member systems, 3) basic structural, insulating and finishing building materials and the rules of their use, 4) structural components and load-bearing systems of buildings, as well as the selected civil engineering structures, 5) basic technical and constructional requirements to be fulfilled by a properly designed, constructed and operated civil structure and/or its structural component.



Skills

The student is able to: 1) obtain information from technical and construction regulations, 2) identify and name essential elements of buildings and other structures, 3) calculate geometrical characteristics of plane figures and calculate cross-sectional forces in statically determined plane bar systems, 4) protect a building against excessive heat and moisture losses.

Social competences

The student is aware of: 1) the need to independently complement and broaden the knowledge on building materials and technologies, 2) the need to take care of one's own and society's health, 3) the need to reduce energy losses and protect the environment, 4) the need to ensure appropriate safety of the civil structure during its design, construction and operation.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures. Written test in two parts: the first part covering the issues of strength of materials and structural mechanics and the second part covering the issues of construction and civil engineering structures. The final mark is based on the points scored in both parts of the examination. A minimum number of points is required for each part of the examination. The first part of the examination consists of 3-5 tasks. The second part of the examination is in the form of a test containing 30-35 questions on the curriculum content presented during lectures and design exercises.

The design exercises are divided into two thematic blocks: block one covering the issues of strength of materials and structural mechanics, block two covering the issues of construction and civil engineering structures. The performance of control works in the field of mechanics and strength of materials; the final mark is determined on the basis of the marks obtained from the control works. Performing a design exercise from the scope of general construction; continuous control of the acquired knowledge, during consultations of the design exercise; the mark is determined on the basis of the correctness of the performed design exercise and questions concerning the knowledge acquired during its performance. The final mark for the design exercises is determined as an average of marks for both parts.

Programme content

Topics of lectures - block one: Basic assumptions and concepts in the theory of construction. Internal forces in trusses, beams and frames. Characteristics of a cross section. Stress-strain behaviour. Beam design problems. Deflection of beams. Eccentric loading. Buckling.

Topics of lectures - block two: Elements of architectural and structural design process. Essential legal acts in the construction industry and related documents. Basic requirements to be met by buildings and other structures. Load types in structural calculations, load schemes and combinations. Basic structural and insulation materials. Essential structural components and load-bearing systems of buildings and elements of finishing: foundations, walls, window and door lintels, binding joists, structural ceilings, floors and floorings, balconies, roofs and flat roofs, roof coverings. Solutions for obtaining energy from solar radiation.



Topics of the control exercises in the field of mechanics and strength of materials: internal forces in trusses, beams and frames, properties of structural section, beam design.

The topic of the design exercise in the field of construction: design of the external wall of a residential building, insulated using the ETICS system. Scope of the exercise: calculation of the wind impact on the external walls of a building, calculation of the load-bearing capacity of the mechanical fasteners and the ETICS system, determination of the required number of mechanical fasteners per 1 sqm of insulation in individual wall fields, calculation of the heat transfer coefficient of the external wall, calculation of the temperature factor on the inner surface of the wall, necessary to avoid critical surface moisture, calculation of the dew point temperature and calculation of relative air humidity at the wall surface on the basis of the analysis of water vapour content in the air.

Teaching methods

The lecture is conducted in the form of a multimedia presentation combined with the traditional teaching method.

Design exercises in the field of mechanics and strength of materials are carried out in a traditional form. The control works are issued to be carried out on their own during the design exercises.

Design exercises in the field of construction: explanation of the scope of the design, presentation of the use of the provided computer software to perform design calculations, checking the correctness of execution of individual stages of the design.

Bibliography

Basic

1. Przewłócki J., Górski J., Podstawy mechaniki budowli, Arkady, Warszawa 2008
2. Zielnica J., Wytrzymałość materiałów, Wyd. PP, 1996
3. Wytrzymałość materiałów. Zarys teorii, przykłady, zadania. (Pr. zbiorowa pod redakcją K. Wrześniowskiego), 1985
4. Podstawy budownictwa dla inżynierów sanitarnych, kier. J. Kuczyński. Arkady, Warszawa 1984
5. Michałak H., Pyrak S., Domy jednorodzinne - konstruowanie i obliczanie. Arkady, Warszawa 2005
6. Nowy poradnik majstra budowlanego, red. J. Panas. Arkady, Warszawa 2012
7. Rozporządzenie w sprawie warunków technicznych, jakim powinny odpowiadać budynki i ich usytuowanie

Additional

1. Orłowski W., Słowański L., Wytrzymałość materiałów. Przykłady obliczeń. Arkady, Warszawa 1978
2. Cywiński Z., Mechanika budowli w zadaniach, PWN 1997



3. Leyko J., Mechanika ogólna, PWN, Warszawa 2007
4. Jakubowicz A., Orłoś Z., Wytrzymałość materiałów, WNT, Warszawa 1997
5. Dyląg Z., Jakubowicz A. , Orłoś Z., Wytrzymałość materiałów, WNT 1999
6. Nowacki W., Mechanika budowli, PWN Warszawa 1975
7. Jastrzębski P., Mutermilch J., Orłowski W., Wytrzymałość materiałów, Arkady , Warszawa 1986
8. Budownictwo ogólne, t.1 - materiały i wyroby budowlane, red. B. Stefańczyk. Arkady, Warszawa 2005
9. Budownictwo ogólne, t.3 - elementy budynków, podstawy projektowania, red. L. Lichołai. Arkady, Warszawa 2008
10. Gaczek M., Jasiczak J., Kuiński M., Siewczyńska M., Izolacyjność termiczna i nośność murowanych ścian zewnętrznych - Rozwiązania i przykłady obliczeń. WPP, Poznań 2011
11. Rokiel M., Hydroizolacje w budownictwie - poradnik. Dom Wydawniczy Medium, Warszawa 2009
12. Mirski J.Z., Łacki K., Budownictwo z technologią, t.2. WSiP 2010
13. Izolacje styropianowe w budownictwie - poradnik. Stowarzyszenie Producentów Styropianu

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	60	2,5
Student's own work (literature studies, preparation for design exercises, performing design exercises, preparation for the test, defence of design and examination) ¹	40	1,5

¹ delete or add other activities as appropriate