



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basics of engineering structures [S1FT2>PKI]

Course

Field of study

Technical Physics

Year/Semester

2/4

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

0

Other

0

Tutorials

0

Projects/seminars

15

Number of credit points

3,00

Coordinators

dr hab. inż. Michał Śledziński

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Lecturers

Prerequisites

Basic knowledge of physics (mechanics) and mathematics. Basic knowledge from engineering graphics - the ability to make sketches and drawings in the rectangular projection; Performing cross-sections and complex drawings of simple machine assemblies; dimensioning rules. Basic knowledge of mechanics and strength of the materials - analysis of the state of load and stress of elements, elementary strength calculations.

Course objective

Explaining students general principles of engineering structures. Obtaining knowledge and understanding of the process of constructing simple mechanical devices.

Course-related learning outcomes

Knowledge:

1. The student has ordered basic knowledge of the general principles of engineering structures
2. The student has detailed knowledge about selected connections and teams in engineering constructions; He knows and understands the process of constructing simple mechanical devices
3. The student knows the rules of engineering graphics and technical drawing and basic elements

standardized in machine construction

Skills:

1. The student can identify the technical problem and propose its solution and design selected elements and simple mechanical constructions
2. The student can perform simple strength calculations and draw and dimension the basic elements of the engineering structure
3. The student can choose materials with appropriate design properties for selected engineering applications

Social competences:

1. The student can work responsibly and creatively on the designated task, independently and in the team
2. The student is aware and understands the importance of the effects of engineering activities, including the environmental impact and the related responsibility for the decisions taken

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: crediting based on general and structural knowledge, at the end of the semester. Assessment criteria: knowledge of the structural features of engineering connections and devices and simple strength calculations.

Project classes: credit based on an individual design task of a simple device and the implementation of selected elements of construction documentation. Assessment criteria: correct execution of strength calculations, assembly drawing and selected executive drawings and their dimensioning.

Programme content

1. Design methodology
2. Identification of load and stress state in machine elements
3. Analysis of operation and kinematics of basic machine parts. Forming the structural design.
4. Analysis of design variants. Strength calculations.
5. Design of basic structural nodes. Selection of structural materials. Standardised elements.
6. Connections and assemblies in machine construction
7. Creating design documentation

Course topics

Lecture programme covers the following topics:

1. Modern approach to design – design thinking. Engineering design.
2. Stages of project task implementation.
3. Principles of construction. Requirements for constructions.
4. Analysis of structural stability.
5. Computer-aided design. Heuristics and bionics.
6. Connections in engineering structures – permanent and separable connections. Characteristics. Principles of design and calculation. Joining techniques. Technological aspects of connections.
7. Screw connections and mechanisms. Threads – parameters and properties. Stress distributions. Calculation algorithm.
8. Bearing assemblies in machine construction. Design and selection of bearings.
9. Machine assemblies – shaping structural features, properties, and design.

Project programme covers the following topics:

1. Analysis of kinematic schemes, geometry, and load state of screw-nut drive systems.
2. Determining forces in structural elements.
3. Selection of structural materials.
4. Strength calculations of structural assemblies.
5. Selection of standardised dimensions.
6. Selection of standardised elements, working with standards.
7. Determining the safety margin of the screw-nut system.
8. Analysis of shaped connections.

9. Creating design documentation for the designed device: calculations, assembly drawings, and detailed drawings.

Teaching methods

Lecture: multimedia presentation, supplemented with teaching aids.

Project classes: Student's design work (individual and team). Presenting construction progress.

Discussion. Project correctness control

Bibliography

Basic:

1. Osiński Z., Podstawy konstrukcji maszyn. PWN Warszawa 2022.
2. Praca zbiorowa pod red. E. Mazanka: Przykłady obliczeń z podstaw konstrukcji maszyn, t. 1-2. WNT Warszawa 2008, 2009
3. Korytkowski B.: Podstawy konstrukcji maszyn. Projektowanie I. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2009.
4. Skrzyszowski Z.: Podnośniki i prasy śrubowe. PKM projektowanie. Wyd. Politechniki Krakowskiej Kraków 2005.

Additional:

1. Szopa T.: Podstawy konstrukcji maszyn. Zasady projektowania i obliczeń inżynierskich, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2012.
2. Kurmaz L W., Kurmaz O. L.: Projektowanie węzłów i części maszyn. Wyd. Politechniki Świętokrzyskiej Kielce 2011.
3. Shigley J. E., Mische Ch. R., Budynas R., G.: Mechanical engineering design. McGraw-Hill Education. cop. 2004.
4. Śledziński M.: Kształtowanie cech konstrukcyjnych tłumika drgań uderzeniowego pneumatycznego. Rozprawa doktorska. Politechnika Poznańska. Poznań 2006.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00