COURSE DESCRIPTION CARD - SYLLABUS

Course name
Frames and load-bearing structures part 1 [N1MiBP1>RiKN1]

Course

Field of study
Mechanical and Automotive Engineering

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
9

Laboratory classes
18

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

Tadeusz Pawłowski

Lecturers

Prerequisites

Knowledge: Knows the basic laws and calculation methods in the field of mechanics and strength of materials. He knows the rules of technical drawing. Skills: He can solve typical calculating tasks in the field of mechanics and strength of materials. Is able to use CAD programs to create technical drawings. Social competences: He can work in a group.

Course objective

Learning the principles of shaping and construction of load-bearing machines. Getting to know the principles of strength calculations of supporting structures of working machines. Optimization of load-bearing structures.

Course-related learning outcomes

Knowledge:
Has basic, ordered knowledge of metal materials used in mechanical engineering, such as alloys of iron, aluminum, copper, etc. used in machine building, and in particular about their structure, properties, methods of production, heat and thermo-chemical treatment and the impact of plastic working on them strength.
Has basic knowledge of the strength of materials, including the basics of the theory of elasticity and

plasticity, stress hypotheses, calculation methods for beams, membranes, shafts, joints and other simple structural elements, as well as methods of testing the strength of materials and the state of deformation and stress in mechanical structures.
Has basic knowledge of manufacturing techniques used in the engineering industry, such as casting, forming, reducing and incremental machining, welding and other joining techniques, cutting, coating and surface treatments.

Skills:
Can use integrated with the packages for spatial modeling, programs for the calculation of mechanical structures by the finite element method and correctly interpret their results.
Can perform basic functional and strength calculations of machine elements such as traction, gear, friction, bearings, rolling and sliding gears, clutches, brakes.
Can perform strength calculations of simple frames and load-bearing structures of machines using elementary strength theories.

Social competences:
Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in case of difficulties in solving the problem on its own.
Is willing to think and act in an entrepreneurial manner.
Is ready to fulfill professional roles responsibly, including:
- observing the rules of professional ethics and requiring this from others,
- caring for the achievements and traditions of the profession.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Assessment of the performance of the supporting structure model by the student and carrying out strength calculations using the available FEM system.

Programme content

Functions of the supporting structure. Basic types of load-bearing structures. Beams and frames, trusses, skeletal and shell structures, boxes. Principles of shaping load-bearing structures. Principles of shaping construction nodes. Optimization of load-bearing structures. Objective function and constraints. Calculations of load-bearing structures with regard to permissible stresses, permissible deformations, limit state Dynamics of load-bearing structures. Static and dynamic stability. Case study. Examples of construction and calculation of load-bearing structures of selected machines.

Course topics

none

Teaching methods

1. Lecture with multimedia presentation.
2. Laboratory - making a model of the load-bearing structure and carrying out strength calculations using the available FEM system.

Bibliography

Basic
1. Praca zbiorowa pod red. Zabrodzkiego J.: Grafika komputerowa. Metody i narzędzia. WN-T, Warszawa, 1994.
2. Kruszewski J., Sawiak S., Wittbrodt L.: Wspomaganie komputerowe CAD/CAM. Metoda sztywnych elementów skończonych w dynamice konstrukcji. WN-T, Warszawa, 1999.
3. Perkowski P.: Technika symulacji cyfrowej. WN-T, Warszawa, 1980.
Additional
1. Zienkiewicz O.C.: Metoda elementów skończonych. Arkady, Warszawa, 1972.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	27	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	73	2,00