



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Fundamentals of machine construction [S1Energ2>PKM]

Course

Field of study Power Engineering	Year/Semester 2/3
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 15	Laboratory classes 0	Other (e.g. online) 0
Tutorials 0	Projects/seminars 0	

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basics of mechanics and strength of materials. Basics of materials science and heat treatment. Engineering graphics. Basic engineering calculations. Technical thinking. Preparation of technical documentation. Individual and team work. Creativity. Honesty and reliability. Regularity. Activity.

Course objective

Transfer of theoretical and practical knowledge in a range of machine design fundamentals. Learning of structure, principles of design and calculations of mechanical devices and their elements. Acquisition of practical skills of designing on the basis of project of a screw gear.

Course-related learning outcomes

Knowledge:

1. Knows design methodology and formulates design and construction assumptions.
2. Identifies the state of loading and stress of machine elements.
3. Selects construction materials.
4. Characterizes the properties and use of joints and mechanical assemblies.
5. Has structured knowledge in the field of knowledge of materials that meet the construction and

operational requirements of machines and devices, modeling of mechanical systems; strength analysis of basic mechanical constructions; has the knowledge needed to understand the principles of operation of basic machine parts, the selection of typical machine parts; knows and understands the essence of technically and technologically proper construction of machines and devices, as well as knows the economic aspects of their construction.

6. Has knowledge of the technique of writing and completing technical and design documentation; knows the basic principles of organizing and conducting research in the field of energy problems and presenting the results of their work.

Skills:

1. Analyzes the kinematics of designed devices.
2. Shapes the construction form of machine elements.
3. Calculates machine parts in terms of strength and stability.
4. Designs basic construction nodes.
5. Assesses variants of construction solutions.
6. Uses security standards and regulations.
7. Develops project documentation.

Social competences:

1. Creativity and conceptual thinking. Presentation of own technical solutions in the team.
2. Recognizes the impact of knowledge and professional development on the level of his life and society.
3. Is able to think environmentally.
4. Understands the need and knows the possibilities of continuous training, raising professional, personal and social competences (eg through second and third degree studies, postgraduate studies, courses); and is ready to critically assess knowledge, recognizes its importance in solving cognitive and practical problems.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: Assessment of knowledge and practical skills during written exam. Additional points for knowledge, activity, interest and creativity.

Project classes: verification of individual projects. Assessment of knowledge and practical skills of design and calculation of machine elements, sketching and drawing of project solutions and unaided work and creativity. assessment of individual project and its defence in a scope of assembly and production drawings and calculations. Additional points for activity, creativity and methodology of work.

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 and examples of structural solutions of mechanisms discussed by the teacher. Tasks for individual or group solution.

Design classes: examples of design solutions presented by the teacher. Calculation and drawing tasks to be carried out by yourself.

Bibliography

Basic:

1. Horwatt W., Bartoszewicz J.: Podstawy konstrukcji mechanicznych dla elektryków. WNT Warszawa 1975.
2. Praca zbiorowa pod red. Z. Osińskiego: Podstawy konstrukcji maszyn. PWN Warszawa 2003.
3. Praca zbiorowa pod red. E. Mazanka: Przykłady obliczeń z podstaw konstrukcji maszyn. WNT Warszawa 2009
4. Juchnikowski W., Żółtowski J.: Podstawy konstrukcji maszyn. Pomoce do projektowania. Oficyna Wydawnicza Politechniki Warszawskiej. Warszawa 2004.
5. Skrzyszowski Z.: Podnośniki i prasy śrubowe. PKM projektowanie. Kraków 2001.
6. Praca zbiorowa pod red. M. Dietricha: Podstawy konstrukcji maszyn. Tom 3, WNT, Warszawa, 1999.

Additional:

1. Oleksiuk W., Paprocki K.: Konstrukcja mechanicznych zespołów sprzętu elektronicznego. WKŁ Warszawa 1997.
2. Poradnik mechanika. Wydawnictwo Rea. Warszawa 2009.

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00