COURSE DESCRIPTION CARD - SYLLABUS

Course name

Engineering Problems Solving by Simple and Advanced Methods

Course

Field of study

Mechanical Engineering

Year/Semester

III/1

Area of study (specialization)

technical sciences

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

English

Form of study

full-time

Requirements

elective

Number of hours

Lecture

7

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

8

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

Dr. Wojciech ŁAPKA, PhD. DSc. Eng.

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Faculty of Mechanical Engineering

Jan Paweł II 24, 61-139 Poznań

tel.: 61 665 2302

Responsible for the course/lecturer:

Prerequisites

Knowledge: basic knowledge of engineering and management, mathemetics (core curriculum for secondary schools, basic level)

Skills: ability to solve elementary problems of engineering based on possessed knowledge, usage of mathematical and engineering issues, the ability to acquire information from indicated sources

Social competences: understanding the need of further education; willingness to cooperate with a team

Course objective

1. Obtaining knowledge of engineering problems solving methods (simple and advanced) in the scope determined by the content of the curriculum, appropriate for the field of study

2. Development of skills to solve simple and advanced engineering problems, perform simple and advanced analysis of problem solving based on gained knowledge

3. Developing teamwork skills.

Course-related learning outcomes

Knowledge

Student is able to define the basic engineering concepts in the range of course content, appropriate for the field of study, deepened knowledge of solving engineering problems by the use of simple and advanced problem solving methods, broaden creative thinking.

Skills

Student is able to obtain information from the literature, databases and other carefully selected sources (also in j. English) in mechanics and mechanical engineering and other technical and engineering problems consistent with the field of study; can integrate the information obtained, to make their interpretation, as well as draw conclusions and formulate and justify opinions.

Student is able to choose the problem solving method for engineering problems, conduct a basic level analysis

Social competences

Student is able to cooperate in a team, be responsible for his/her position in the team and actively participate in analysis and problem solving process, set priorities for implementation of the task

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Evaluation of performed verbal presentations and paper version of final project that includes the analysis of solving the selected engineering problem by at least three simple and one advanced methods.

Programme content

Engineering Problems Solving Process, creative tools, The task or problem? Creative design. Define problems. The human mind - a tool for creativity. Simple troubleshooting techniques, such as. Questions Quintilianus, scribble da Vinci, Arnolds Postcards, SCAMPER, DOIT, questioning assumptions, reamer view and ideas De Bono, etc., And advanced problem-solving methods, such as. Simplex, brainstorming, sketching mind, six thinking hats, etc. Algorithmic creative thinking-how innovative thinking and basics of TRIZ algorithm. Information technology to help resolve problems.

Teaching methods

Lectures: multimedia presentations, a presentation illustrated with examples given on the board.
Project/seminar: evaluation of multimedia and verbal presentations, discussion about problem analysis.

Bibliography

Basic

1. Buzan Tony, Mind Map Mastery: The Complete Guide to Learning and Using the Most Powerful Thinking Tool in the Universe, 2018.

2.VanGundy B. A., "101 Activities for Teaching Creativity and Problem Solving", Pfeiffer and John Wiley & Sons Inc. San Francisco 2007,p. 391.

3. C. Cempel, "Inżynieria Kreatywności w Projektowaniu Innowacji", Wydawnictwo ICT PIB Radom - Poznań 2013.

4. Savransky Semyon D., "Engineering of Creativity - Introduction to TRIZ Methodology of Inventive Problem Solving" CRC Press, Boca Raton, New York, USA, 2000.

5. Eder W. E., Hosnedl S., Design Engineering - A Manual for Enhanced Creativity, CRC Presss, New York 2008, p. 588

6. Gardner H., "Frames of the Mind', Basic Books, New York 1983, p. 440.

7. Tan O. S., (edit), "Problem Based Learning and Creativity", CENGAGE Learning, Singapore, 2009, p. 244.

Additional

1. Orloff M. A., Inventive Thinking through TRIZ - a practical guide, Springer, Berlin 2006, p. 351.

2. Rantanen K., Domb E., "Simplified TRIZ – New problem Solving Applications for Engineers and Manufacturing Professionals", CRC Press Company, London, 2002, p. 251.

3. Clegg B., Birch P., "Przyspieszony Kurs Kreatywności", Wyd. One Press, Warszawa, 2007, s. 336.

4. DeBono E., "Naucz Swoje Dziecko Myśleć", Wyd. Prima, Warszawa 1996.

Breakdown of average student's workload

	Hours	ECTS
Total workload	62	2,0
Classes requiring direct contact with the teacher	20	1,0
Student's own work (literature studies, preparation for seminar classes/tutorials, preparation for tests/exam, project preparation) [1]	42	1,0

[1] delete or add other activities as appropriate