COURSE DESCRIPTION CARD - SYLLABUS

Course name

Rapid prototyping

Course

Field of study

Production Engineering and Management

Year/Semester

7/4

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

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Faculty of Mechanical Engineering

Piotrowo 3 Str, PL-60-965 Poznan, POLAND

Responsible for the course/lecturer:

Prerequisites

Knowledge in scope of information technologies, computer graphics and engineering drawing, CAD/CAM systems and manufacturing processes. Good skill to develop a solid 3D model of a prototype in a CAD 3D system. Being able to cooperate in a project team, awareness of responsibility for performed tasks and understanding of need of obtaining new knowledge.

Course objective

Obtaining knowledge and skills about techniques of Rapid Prototyping, Rapid Tooling and Rapid Manufacturing using additive manufacturing technologies (3D printing).

Course-related learning outcomes

Knowledge

1. Student describes place of prototyping in contemporary design process.

2. Student describes process basics of Rapid Prototyping, indicates individial properties of applied additive manufacturing technologies (3D printing) and possibilities of their use in product development.

3. Student describes possibilities of application of Rapid Tooling and Rapid Manufacturing in product development, describes procedures used in Vacuum Casting process.

Skills

1. Student builds 3D models, prepares and processes polygon mesh files (STL), selecting resolution for needs of additive manufacturing.

2. Student makes prototypes using 3D Printing, FDM and stereolithography processes. Student prepares a batch file and selects process parameters, is able to perform post-processing of obtained physical models.

3. Student prepares models and makes prototypes using Vacuum Casting technology.

Social competences

1. Student is open on implementation of RP/RM (3D printing) technologies in engineering activities

2. Student is able to develop his knowledge in the subject on his own.

3. Student can work in a project team using techniques of rapid product development.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Partial marks:

a) lectures:

- on the basis of answers to questions regarding material from previous lectures

b) laboratories:

- on the basis of evaluation of current advancement in realization of given tasks

Summary mark:

a) lectures:

- evaluation of knowledge by written final test with open and closed questions

b) laboratories:

- evaluation of preparation of student for individual laboratory classes and evaluation of skills presented in particular exercises

- continuous evaluation, each class (oral answers)

- final short test, closed questions

Programme content

Lectures:

Modern methods of production preparation. Additive technologies (3D printing) in Rapid Prototyping, Rapid Manufacturing and Rapid Tooling, engineering applications.

Preparation of data for RP processes. STL (polygon mesh) file format.

Materials and devices used in RP/RT processes. Selected technologies: SLA, SLS, FDM, 3DP, LOM and similar.

Post-processing (finishing treatment) of models. Principles and application of Vacuum Casting technology.

Examples of use of 3D printed prototypes, Rapid Manufacturing and Rapid Tooling techniques.

Laboratory:

Preparation of data for model manufacturing, STL file preparation and processing, resolution selection.

Manufacturing of exemplary prototypes using FDM process. Post-processing of obtained prototypes.

Teaching methods

Lecture part: mostly in the form of conventional lectures, content submitted in a form ready to remember; partly lectures take the form of a problem with active discussion with students.

Laboratory part: presentation by the teacher of practical issues related to additive manufacturing and independent work of students at research positions with supervision of the teacher.

Bibliography

Basic

1. E. Chlebus, Innowacyjne technologie Rapid Prototyping - Rapid Tooling w rozwoju produktu, Oficyna Wydawnicza Politechniki Wrocławskiej , Wrocław, 2003

2. Chua C. K., Leong K. F., and Lim C. S., 2010, “Rapid Prototyping: Principles and Applications”, World Scientific Publishing Co. Pte. Ltd., Singapore

3. Ian Gibson, David W. Rosen, Brent Stucker , 2010, Additive Manufacturing Technologies - Rapid Prototyping to Direct Digital Manufacturing, Springer, Boston, MA

Additional

1. Pająk E., Dudziak A., Górski F., Wichniarek R., Techniki przyrostowe i wirtualna rzeczywistość w procesach przygotowania produkcji, Poznań 2011, ISBN 978 83 86912 56 8, Wydawnictwo Promocja 21

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	30	1,0

[1] delete or add other activities as appropriate