COURSE DESCRIPTION CARD - SYLLABUS

Course name
Additive manufacturing [S2ZiIP2>WPr]

Course

Field of study
Management and Production Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
45

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

Knowledge in the field of information technology and expertise in engineering graphics, CAD/CAM systems, and manufacturing techniques. The ability to prepare a digital product model using 3D CAD software. Capability to collaborate effectively in a design team, awareness of accountability for tasks performed, and understanding the need to continuously acquire new knowledge.

Course objective

Understanding of additive manufacturing techniques and methods, including knowledge of the additive manufacturing production process, data preparation methods, finishing (post-processing) techniques, basic machine operation and maintenance.

Course-related learning outcomes

Knowledge:
1. The student has an expanded knowledge of manufacturing techniques, including additive manufacturing and rapid prototyping.
2. The student has knowledge of developmental trends in manufacturing techniques.
3. The student has well-established theoretical knowledge in the field of assessing the quality of

products and production processes.

Skills:
1. Is able to notice and identify problems occurring in systems and production processes and select and use methods and tools appropriate to solve them
2. Is able to select a manufacturing technique for the production of products
3. Is able to organize production taking into account customer demand and production resources

Social competences:
1. Is aware of the need to critically analyze and evaluate their proposals and actions
2. Is aware of the shortcomings of his knowledge and the need to cooperate with experienced employees and experts
3. Can think and act in a creative and enterprising way

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

a) in the field of lectures, the assumed learning outcomes are verified by:
Assessment of knowledge on a written colloquium. Questions can be both open-ended and closed-ended. Passing the lecture if obtaining at least 50.1% correct answers. Up to 50.0% - ndst, from 50.1% to 60.0% - dst, from 60.1% to 70.0% - dst+, from 70.1 to 80 - db, from 80.1% to 90 .0% - db+, from 90.1% - very good.
b) in the field of laboratories, the assumed learning outcomes are verified by:
Evaluation of the student's preparation for individual laboratory classes and evaluation of the realization of laboratory exercises.

Programme content

- Additive manufacturing - basic definitions and concepts.
- Detailed discussion of the most important additive manufacturing methods.
- Application of additive manufacturing in engineering activities.

Course topics

Lectures:
- Additive manufacturing - introduction, sources of knowledge, essential concepts.
- FDM/FFF methods - detailed discussion.
- SLA/DLP methods - detailed discussion.
- Powder methods - detailed discussion.
- Example projects carried out using additive manufacturing.

Laboratory:
- Introduction to the Additive Manufacturing Laboratory and discuss about health and safety concerns.
- Methods of preparing data for the additive manufacturing process.
- Preparation of the manufacturing process using the FFF method.
- FFF manufacturing.
- Preparation of the manufacturing process using the DLP method.
- Operation and maintenance of DLP machine.
- DLP manufacturing.
- Iterative design and manufacture of an example product.

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. Lecture conducted remotely using the synchronous access method.
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. P. Siemieński, G. Budzik, “Techniki przyrostowe. Druk 3D. Drukarki 3D”, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2015
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
2. G. Budzik, J. Woźniak, Ł. Przeszłowski, "Druk 3D jako element przemysłu przeszłości. Analiza rynku i tendencje rozwoju", Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów 2022
3. B. Evans, "Practical 3D Printers: The Science and Art of 3D Printing", Apress, New York, 2012

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	65	2,50