# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Additive manufacturing [S1ZiIP2>WyP]

## Course

Field of study
Management and Production 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
full-time

Requirements
compulsory

## Number of hours

Lecture
15

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

## Number of credit points

3,00

## Coordinators

## Lecturers

## Prerequisites

Knowledge in the field of information technology, engineering graphics, CAD/CAM systems, and traditional manufacturing technologies. Ability to prepare a digital model of a product in a 3D CAD system. Ability to use basic workshop tools (scissors, file, screwdriver, etc.)

## Course objective

Understanding techniques and methods of additive manufacturing. The scope of competencies includes knowledge of additive manufacturing processes, methods for preparing data for their execution, post-processing methods for produced items, and basic tasks related to machine operation and maintenance.

## Course-related learning outcomes

Knowledge:
1. The student has basic knowledge of additive manufacturing techniques
2. The student is aware of the developmental trends in manufacturing techniques
3. The student is familiar with methods for evaluating the quality of additively manufactured components

Skills:
1. The student can perceive and identify issues arising in the additive manufacturing process

2. The student can select manufacturing parameters for product production
3. The student can perform basic tasks related to the operation and maintenance of additive manufacturing machines

Social competences:
1. The student understands the impact of additive manufacturing technology on the economy
2. The student is aware of their knowledge gaps and the necessity of collaborating with experienced professionals and experts
3. The student can assess the applicability of additive manufacturing in various aspects of community life

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

a) Regarding lectures, the verification of assumed learning outcomes is conducted through:
Assessment of knowledge in a written exam during the final classes of the semester. Questions cover both open-ended and closed-ended formats. Passing threshold: 50%.
Assignment of grades to percentage ranges of results: <90-100> very good; <80-90) good plus; <70-80) good; <60-70) satisfactory plus; <50-60) satisfactory; <0-50) unsatisfactory.
b) For laboratories, the verification of assumed learning outcomes is carried out by:
Assessing student preparation for individual laboratory sessions and evaluating the execution of laboratory exercises.

## Programme content

1. Additive manufacturing - introduction, basic concepts, sources of knowledge and AM place in the economy.
2. Engineering applications of additive manufacturing technologies - concepts and oractical issues.
3. Classification and discussion of additive manufacturing techniques and methods.
4. Examples of projects implemented using additive manufacturing methods.

## Course topics

Lectures:
- Introduction to additive manufacturing
- Basic concepts related to additive manufacturing.
- Contemporary methods of production preparation. Additive technologies (3D printing) in Rapid Prototyping, Rapid Manufacturing, and Rapid Tooling, engineering applications.
- Fundamental methods of additive manufacturing.
- Data exchange about the product in additive manufacturing processes.
- Sample projects realized using additive manufacturing.

Laboratory:
- Familiarizing students with the additive manufacturing Laboratory and discussing occupational health and safety principles.
- Methods for preparing data for the additive manufacturing process.
- Preparation of the manufacturing process using the Fused Filament Fabrication (FFF) method.
- Operation, calibration, and maintenance of FFF devices.
- Additive manufacturing using FFF (creating connections, using different materials, parameter selection).
- Post-processing for additively manufactured products and quality assessment.
- Evaluation of properties of additively manufactured products.

## 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. 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 | 75 | 3,00 |
| Classes requiring direct contact with the teacher | 45 | 2,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 30 | 1,00 |