

GENERAL INFORMATION					
Course name		AM1. Materials for Additive Manufacturing			
Semester	3	Character	Compulsory	Type of module	Specialisation
ECTS	4		Modality	Face-to-face	
Higher Education Institution(s)			Koszalin University of Technology		
Lecturer(s)			Błażej Bałasz Dorota Laskowska Tomasz Królikowski		
LEARNING AND TEACHING					
ESCO Occupation(s)			Manufacturing engineer		
ESCO Skill & Competences (*no ESCO)			Select material to process Produce sustainable products Statistical process control Test Materials		
Learning outcomes (Please refer to Appendix 4 for the interpretation of the acronym)			KU1, EP3, EP4		
Teaching methods			Lectures. Flipped Classroom Case Studies Simulation-Based Learning Workshops		
Assessment methods			Examination Technical report Oral presentation & defence		
CONTENTS					
Previous requirements (if necessary)					
Content index					
<div>1. Introduction to additively manufactured materials:<ul style="list-style-type: none">Basic properties of polymers and metals.Criteria for the selection of materials for AM technology.</div> <div>2. Types of polymers used in 3D printing:<ul style="list-style-type: none">Thermoplastics and thermosets.Characteristics of materials such as PLA, ABS, PETG.</div> <div>3. Types of metals used in 3D printing:<ul style="list-style-type: none">Aluminium, titanium and nickel alloys.Properties of stainless steel and super alloys.</div> <div>4. Composite materials in additive manufacturing:<ul style="list-style-type: none">Polymer composites with carbon fibres.Metal composites with ceramic inserts.</div> <div>5. Photopolymer polymers:<ul style="list-style-type: none">Resins used in SLA and DLP technology.Photopolymerisation and its effect on product properties.</div> <div>6. Powder materials for L-PBF:<ul style="list-style-type: none">Characterisation of metal powders for L-PBF.Effect of granulation and particle shape on the printing process.</div> <div>7. Rheology of polymeric materials:<ul style="list-style-type: none">Influence of rheological properties on the FDM process.Investigation and optimisation of polymer rheology.</div> <div>8. Thermal properties of polymers and metals:<ul style="list-style-type: none">Analysis of temperature changes during printing.Effect of heat on internal structures and dimensional stability.</div> <div>9. Mechanical characterisation of materials for AM:<ul style="list-style-type: none">Strength tests of polymers and metals.Analysis of mechanical properties in the context of industrial applications.</div> <div>10. Microstructure of additively manufactured materials:<ul style="list-style-type: none">Microstructure analysis of polymers and metals.</div>					

- Microstructure testing techniques such as electron microscopy.
- 11. Smart and functional materials in AM:
 - Self-repairing polymers.
 - Shape memory metals and their applications.
- 12. Ecological aspects of materials for AM:
 - Biodegradable polymers and metal recycling.
 - Sustainability in additive manufacturing.
- 13. Materials for the manufacture of bioimplants:
 - Biocompatible polymers and metals.
 - Medical applications and regulatory requirements.
- 14. Nano-materials in AM:
 - Polymers and metals enriched with nanoparticles.
 - Effect of nanoparticles on mechanical and thermal properties.
- 15. The future of additively manufactured materials:
 - New materials and their potential applications.
 - Innovations and developments in materials technology

SUPPORTING BIBLIOGRAPHIC REFERENCES

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SOFTWARE

Particle Analyser, Volume Graphics