



FH JOANNEUM University of Applied Sciences





GENERAL INFORMATION								
Course name AM3. Addit				ve l	e Manufacturing Technology from Metals			
Semester	3		Character		Compulsory	Type of module	Specialisati on	
ECTS	5				Modality	Face-to-face		
Higher Education Institution				(s)	Koszalin University of Technology			
Lecturer(s)					Błażej Bałasz Dorota Laskowska			
LEARNING AND TEACHING								
ESCO Occupation(s)				Manufacturing engineer Calculation engineer				
ESCO Skill & Competences (*no ESCO)				Select material to process Produce sustainable products Create a product's virtual model 3D printing process Statistical process control				
Learning outcomes (Please refer to Appendix 4 for the interpretation of the acronym)				KU1, EA1, EP3				
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								

- 1. Fundamentals of L-PBF technology:
 - Principle of the technology.
 - Types of lasers used in L-PBF.
 - Mechanism of powder melting by laser.
- 2. Powder preparation process:
 - Drying and mixing of powder.
 - Pre-process powder quality control.
- 3. Optimisation of process parameters:
- Laser power settings.
 - Scanning speed.
 - Layer thickness and other parameters affecting product quality.
- 4. Designing structures for L-PBF:
 - Principles of part design with additive technology in mind.
 - CAD software and its application in design for L-PBF.
 - Support techniques (support structures) in 3D printing.
- 5. Manufacturing process:
 - Printing stages: powder application, laser scanning, layer formation.
 - Real-time process monitoring and control.
- 6. Post-printing processing:
 - Removal of supports.
 - Thermal and mechanical methods for finishing the product.
 - Secondary sintering and other methods to improve mechanical properties.
- 7. Introduction to Binder Jetting technology:
 - Principle of Binder Jetting technology.
 - History and development of Binder Jetting technology.
 - Basic components of the Binder Jetting printer and their functions.
- 8. Printing process in Binder Jetting technology:









- Printing process steps: from powder application, through binder injection to curing.
- Key process parameters and their impact on print quality.
- Typical challenges and technological problems in Binder Jetting.
- 9. The sintering process in Binder Jetting:
 - Principles of the sintering process.
 - Sintering flow of metal powders after the Binder Jetting stage.
 - Analysis of the influence of sintering parameters on the properties of the final product.
- 10. Optimisation of the sintering process:
 - Techniques for controlling sintering process parameters.
 - Effects of temperature, time and atmosphere on the quality of the sintered material.
 - Tools and methods for monitoring and regulating the process.
- 11. Comparison of Binder Jetting products after sintering and without sintering:
 - Differences in mechanical and structural properties.
 - Application of different methods for assessing product quality.
 - Practical examples of applications of products after the sintering process.
- 12. Quality control and testing:
 - Non-destructive testing methods.
 - Analysis of the mechanical and structural properties of a product.
 - Microscopic techniques for microstructure analysis.
- 13. Practical applications:
 - Examples of components manufactured using L-PBF.
 - Industries using L-PBF technology: aerospace, medicine, automotive, energy.
- 14. Practical applications:
 - Examples of components manufactured using Binder Jetting.
 - Industries using Binder Jetting: aerospace, medicine, energy.
- 15. Future and innovation in L-PBF:
 - New materials and their applications.
 - Development of the technology and its impact on industry.

SUPPORTING BIBLIOGRAPHIC REFERENCES

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SOFTWARE

2Build, ExOne, Ansys, Simufact Additive