

MS4642 – Additive Manufacturing of Materials

Course Code	MS4642				
Course Title	Additive Manufacturing of Materials				
Pre-requisites	MS2012	Properties of Materials			
	MS2015	Introduction to Materials Science			
No of AUs	1				
Contact Hours	LECTURES	13 hrs	TUTORIALS	NIL	

Course Aims

The aim of this course is to provide a practical overview of Additive Manufacturing (AM) techniques and the impact of their process flows on the properties of the materials produced. Students will be taught how to critically evaluate the advantages, limitations and material compatibility of each AM technique. The coursework will provide students with the means to select the most appropriate AM technique and optimize the processing parameters for their needs. It will also include recent advances in AM to ensure students stay abreast with the most cutting-edge developments, allowing their knowledge to be relevant and industry-ready upon graduation.

This course is most suitable for material scientists and engineers who would like to understand more about the possibilities of material processing through AM and for process engineers and scientists to understand more about the effect of AM processes on the material properties.

Intended Learning Outcomes (ILO)

By the end of this course, you (as a student) would be able to:

1. List and describe the 7 major categories of Additive Manufacturing (AM)
2. Understand the working principles of each technique
3. Explain the advantages and limitations of each technique
4. Explain how the process flow of each technique affects material compatibility and performance
5. Identify material defects and explain they arise
6. Demonstrate knowledge on the applicability of AM materials

Course Content

1. Introduction to Additive Manufacturing: What is it? Why is important? Latest news.
2. Additive Manufacturing: Software; Basic explanation and preparation of STL files and gcode
3. Short overview on the fundamentals of material elasticity and viscoelasticity, mechanics of materials, microstructures
4. Description of the 7 categories of Additive Manufacturing – process flow; advantages and limitations; effect on material compatibility and performance (dimensional stability, structural properties etc.)
5. Effect of processing parameters on defect formation

Assessment

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weightage	Team/Individual	Assessment Rubrics

1. Continuous Assessment 1 (CA1)	1-6	<ul style="list-style-type: none"> • Engineering knowledge and • Problem analysis 	50	Individual	<ul style="list-style-type: none"> • Demonstration of critical thinking skills • Communication skills in organization of content
2. Continuous Assessment 2 (CA2)	1-6	<ul style="list-style-type: none"> • Engineering knowledge and • Problem analysis 	50	Individual	
Total			100%		

Reading and References

1. "3D Printing and Additive Manufacturing: Principles and Applications", 5th edition, World Scientific (2017)

Course Policies and Student Responsibilities

Absentee in continuous assessment must be supported by a medical certificate submitted through the University online system.

Attendance is taken for every tutorial class for information on student's participation of class discussion.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.