Module Code	**ME5MM1**
Module Name	**Additive Manufacturing and Laser Processing**
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	Assistant Professor Rocco Lupoi (lupoir@tcd.ie)
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students should be able to: 1. Calculate power requirements and process performance in laser manufacturing. 2. Understand the basic working mechanisms of lasers, components, and be aware of the laser types currently available. 3. Be aware of the hazards involved in dealing with lasers and safety classification. 4. Develop and present a conceptual design solution to a precision machine operating. The specifics of this outcome will vary on a year to year basis. 5. Understanding the role of optics in laser based systems. 6. Compare against each other, the most relevant additive technologies such as Selective Laser Melting and Cold Spray. Have an understanding of involved processing parameters. **Graduate Attributes: levels of attainment** To act responsibly - Choose an item. To think independently - Choose an item. To develop continuously - Choose an item. To communicate effectively - Choose an item.
Module Content	• Lasers and basic principles. Cavity design for CO_2 lasers. Laser cutting • Laser drilling • Laser welding • Laser surface treatments. Laser micro-manufacturing. • Micro-turning, micro-milling and micro-grinding – principles and operations • Metal Additive Manufacturing **Module Description** In high value added manufacturing industry, engineers are required to understand how mechanical systems and materials behave at length scales of microns and nanometres. The objective of this module is to

[1] TEP Glossary

	develop the student's skills and knowledge in precision engineering, micro and nano-engineering. The module will consider selected topics in precision, micro and nanomanufacturing, ranging from enabling technologies and processes to applications. The module is research-lead, hence the content can vary on a year to year basis. Currently, most of the module is around LASER based manufacturing and LASER-Additive Manufacturing (3D printing) with metallic materials. The module will require an active participation of the students.
Teaching and Learning Methods	This module is typically a small group environment with approximately 30 or less people participating. Hence the class forms the basis for discussion on topics, as well as more formal podium style lectures. Examples related in the class are often based on topical issues. Visiting lectures range from industry to visiting researchers.

Assessment Details[2]
Please include the following:

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

Assessment Component	Assessment Description	LO Addressed	% of total	Week due
Written Exam	Exam		100%	

Reassessment Requirements

Contact Hours and Indicative Student Workload[2]

Contact hours: 44 Hours
Independent Study (preparation for course and review of materials):
Independent Study (preparation for assessment, incl. completion of assessment):

[2] TEP Guidelines on Workload and Assessment

Recommended Reading List	Kalpakjian & Schmid, 2006, Manufacturing Engineering & Technology, Pearson pub. Dornfeld & Lee, 2007, Precision Manufacturing, Springer pub. W. Steen, Laser Material Processing. Journal papers recommended in class.
Module Pre-requisite	
Module Co-requisite	
Module Website	
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	
Module Approval Date	16/07/2019
Approved by	Nicole Byrne
Academic Start Year	2019
Academic Year of Date	2019 - 2020