Module Code	**MEU44B05**
Module Name	**Laser Processing & Additive Manufacturing 1**
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	Prof. 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. Comprehend the fundamentals of different additive manufacturing technologies, whether they are based on cold spray or metal melting. 2. Provide an appreciation for why additive manufacturing is so important to many branches of industry and how to apply additive manufacturing technology in different settings. 3. Compare against each other, the most relevant additive technologies such as Laser Powder Bed Fusion and Cold Spray. Understand involved processing parameters and advantages and challenges with implementing robotics assisted additive manufacturing methods. 4. Calculate power requirements and process performance in laser manufacturing. 5. Understand the basic working mechanisms of lasers, components, and be aware of the laser types currently available. 6. Understanding the role of optics in laser-based systems. **Graduate Attributes: levels of attainment** To act responsibly - Introduced To think independently - Enhanced To develop continuously - Enhanced To communicate effectively - Introduced

[1] TEP Glossary

Module Content	• Introduction to Additive Manufacturing • Lasers and basic principles. Cavity design for CO2 lasers. Laser cutting, drilling, and welding. Laser surface treatments. Laser micro-manufacturing. • Laser Powder Bed Fusion (L-PBF) • Powder metallurgy • Titanium metallurgy and heat treatment processes • Robot Assisted Additive Manufacturing • Thermal Spray **Module description:** In high value-added manufacturing industry, engineers are required to understand how mechanical systems and materials behave at length scales at the micron level. The objective of this module is to develop the student's skills and knowledge in both precision engineering and micro engineering. The module will consider selected topics in precision, micro-manufacturing, 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, LASER-Additive Manufacturing (3D printing) with metallic materials, and related automation. The module will require an active participation of the students.
Teaching and Learning Methods	This module is taught using a combination of lecturers, multiple choice review quizzes, and visiting lectures range from industry to visiting researchers. All lecture notes and multiple-choice quizzes will be available through Blackboard.

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
Continuous Assessment	Multiple Choice Quizzes	1-8	100%	Continuous

Reassessment Requirements

Contact Hours and Indicative Student Workload[2]

Contact hours: 42 Hours (33 lectures)
Independent Study (preparation for course and review of materials): 39
Independent Study (preparation for assessment, incl. completion of assessment): 39

Recommended Reading List

- Groover's Principles of Modern Manufacturing, materials, processes, and systems. SI Version. Mikell P. Groover. ISBN: 978-1-119-24912-2.
- Manufacturing Engineering and Technology. Kalpakjian and Schmid

Module Pre-requisite	None
Module Co-requisite	None
Module Website	N.A
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	No
Module Approval Date	4/06/2026
Approved by	Nicole Byrne
Academic Start Year	2026
Academic Year of Date	2026- 2027

[2] TEP Guidelines on Workload and Assessment