Module Code	MEU11E14-
Module Name	Experimental Methods and Data Centric Engineering
ECTS Weighting	5 ECTS
Semester taught	Semester 1
Module Coordinator/s	Assistant Prof. John Kennedy (jkenned5@tcd.ie) Overall Coordinator Assistant Prof. Julie Clarke (julie.clarke@tcd.ie) Prof. Dan Kilper (dan.kilper@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: LO1 outline the role of data centric engineering in modern design; LO2 explain the requirements for data acquisition processes to represent and reproduce real world phenomena LO3.identify the sources and nature of experimental error; LO4.identify and quantify the static and dynamic characteristics of instruments e.g. bandwidth; LO5.understand the role of calibration in the use of common engineering sensors LO6.apply simple electrical principles in sensing application e.g. resistance strain measurement and the Wheatstone bridge; LO7.select sensors for temperature, strain and displacement measurement; LO8 model trends in a set of data using a least squares straight line fit both manually and using modern computational software LO9 outline the use and challenges of large scale data acquisition in modelling and predicting trends in behaviour LO10. collect and analyse data gathered from a survey for engineering system status assessment LO11. write a technical report; **Graduate Attributes: levels of attainment** To act responsibly - Enhanced To think independently - Enhanced To develop continuously - Enhanced To communicate effectively - Enhanced

Module Content	The ability to conduct accurate and repeatable measurements from reliable sensors is an essential task of the professional engineer. The proliferation of sensors both physical and virtual has revolutionised engineering design workflows through Data Centric Engineering design ideas. The aim of this module is to provide exposure to the concepts and processes of modern engineering measurement and experimental techniques now expressed through the Data Centric Engineering workflow. The module prepares students for conducting their first experiments in engineering and exploiting the data gathered with modern toolsets. Students will study the role of error and uncertainty in measurement and data analysis, the operating principles of commonly used measurement devices and the principles of data conversion including analog to digital converters and digital to analog converters. This will equip students to prepare and conduct experiments and enable them to complete a real world data acquisition and analysis task before completion of the module.
Teaching and Learning Methods	The module content is introduced through a combination of lectures and tutorials. During the module the students will utilise this knowledge to critique a series of online experiments and perform the associated data analysis tasks. This repeated learning cycle, conducted in a blended learning environment, will prepare the students to conduct a real world experiment in the latter half of the module.

Assessment Details
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 (provisional)
Written examination	End of semester examination	1-11	75	Exam period
Assignments	Traffic data analysis	11	10	Week 8
Assignments	Online web series experiments	1-7	15	Staggered every 2 weeks

Reassessment Requirements	Written Examination

Contact Hours and Indicative Student Workload Error! Bookmark not defined.	**Contact hours: 44 (33 Lectures, 11 tutorials)**
	Independent Study (preparation for course and review of materials): 30
	Independent Study (preparation for assessment, incl. completion of assessment): 44

Recommended Reading List	Experimental Methods: An Introduction to the Analysis and Presentation of Data, Les Kirkup, Wiley
Module Pre-requisite	NA
Module Co-requisite	NA
Module Website	https://www.tcd.ie/Engineering/undergraduate/baiyear1/modules/1E11.pdf
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	No
Module Approval Date	
Approved by	
Academic Start Year	September 26th 2022
Academic Year of Date	2022/2023