Module Code	CE7M05 (also CEU44E03/5E2)
Module Name	Research Methods
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 1
Module Coordinator/s	Assistant Prof. David O'Connell (david.oconnell@tcd.ie)
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	Learning outcomes On successful completion of this module, students will be able to: 1. Plan and manage a postgraduate research project 2. Critically appraise of existing research tools, methods and publications 3. Identify scope of future research and design a research proposal 4. Summarise, communicate (in written and oral form) research within and outside their own field 5. Recognise issues of plagiarism, confidentiality, data protection and other ethical issues 6. Design engineering experiments and analyse and interpret quantitative information collected 7. Identify and apply appropriate statistical software tool for experimental problem solving **Graduate Attributes: levels of attainment** To act responsibly - Attained To think independently - Attained To develop continuously - Attained To communicate effectively - Enhanced

Module Content	This course covers research philosophies in engineering, research in academia, research scopes & problems, research process and design. Also covered are characteristics of good research and choice of research topic. Components of research proposal preparation, literature review, research strategies, research ethics, research access sources and processes are covered. The module covers and explores data collection and analysis, sample analysis, software application, report writing and presentation.
Teaching and Learning Methods	Lectures & seminars given by lecturers, other academics and research experts. Group/Individual learning of statistical software *(Lecture notes and presentation will all be available online in 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
Ethics Approval Report		1,2,5	15	Week1, Sem 2
Experimental Design		1,6,7	40	Week1, Sem 2
Literature Review		1-4	45	Week 4, Sem 2

Reassessment Requirements

Contact Hours and Indicative Student Workload[2]

Contact hours: 22hrs (2 hrs lecture per week)
Independent Study (preparation for course and review of materials): 50hrs
Independent Study (preparation for assessment, incl. completion of assessment): 50 hrs

Recommended Reading List

Creswell, J. W. Research design: Qualitative, quantitative and mixed methods approach. 3rd Ed. Thousand Oaks, CA: Sage., 2009.

- Peter Bock. 2007. Getting it Right: R&D Methods for Science and Engineering. Academic Press.
- Miller & Freund's Probability and Statistics for Engineers 8th Economy Edition by Richard A. Johnson, Irwin Miller and John Freund (2010)
- Douglas C. Montgomery, George C. Runger. Applied Statistics and Probability for Engineers, 4th Edition, Wiley; ISBN: 978-0-471-74589-1, June 2006.

Module Pre-requisite

None

Module Co-requisite

None

Module Website

Are other Schools/Departments

involved in the delivery of this module? If yes, please provide details.	
Module Approval Date	
Approved by	
Academic Start Year	September 2020
Academic Year of Date	2020-21

COVID-19 contingency statement:

While the intention is to deliver some lectures, tutorials and labs face-to-face, there is uncertainty due to the Covid-19 situation and the entire module delivery may need to change to an online delivery if required by government restrictions. In the case of a possible new lockdown scenario during teaching term:

- All lectures, tutorials and labs will be delivered online using Blackboard. Some of these sessions will be ***live*** sessions and your attendance at live sessions is required.
- Assignments and examinations will be conducted and submitted online.