

MODULE CODE AND MODULE NAME [5 credits]

CE5E2: Research Methods

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Module organisation

This module runs throughout the academic year both in semester 1 and 2.

The module comprises of two hour long lectures per week in the first 12 weeks of the academic year. There are no examinations in this module.

Module description, aims and contribution to programme

This module will provide an introduction to students regarding the key aspects of research in engineering, research methods & designs, data collection and analysis, ethical and legal perspectives.

The course aims to:

- Develop a critical outlook in students regarding published research
- Support students in the development of their research project
- Expose students to the organisation, conduct & implementation of research in universities & research institutes
- Enable students to utilise the available research resources and develop a supportive research environment.

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

Module content

Research Philosophies in Engineering, Research in Academia, Research scopes & problems, Research process and design, Characteristics of good research and choice of research topic.

Components of research proposal, Literature review, Research strategies, Research ethics, Research access. Data collection, Data analysis, Sampling analysis, Software training, Report writing and Presentation.

Teaching strategies

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

A participation-based marking scheme is used in this module. A multiplicative factor of 0.9 or less will be applied to the total received mark of a student in this module, if the student misses more than a third of their course of study or fail to submit a third of the required course work in any term.

Assessment is through written coursework and presentations, linked to the individual research project being completed by each student (see 5E1). Completion by end of semester 2.

METHODS

1. Research Proposal Report – Friday, 26th Oct 2018 [Semester 1, Wk 7] (25%)

2. Research Proposal Presentation – Monday, 22nd Oct 2018 [Semester 1, Wk 7](5%)
3. Design of Experiment – 15 Feb, 2019 (30%)
4. Ethics Essay - Friday, 8th March 2019 [Semester 2, Wk 7] (10%)
5. Research paper – Monday, 15th April 2019 [Semester 2, Revision week] (30%)

Required textbook

- 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.

Further information

Please refer to Blackboard for any further details on this module. (mymodule.tcd.ie)

Attention: Supervisors

Please refer to the remainder of this document for details on the assignments and marking schemes.

Attention: MAI project supervisors in School of Engineering

Details of assignments to be marked by MAI project supervisors

No.	Assignment	Total Marks	Submission Deadline	Submission Procedure	Submission Format
1	Preparation of a research proposal	Out of 100 (marking scheme in pg4)	End of wk 7, sem 1 Friday, 26th Oct 2018	To be submitted by email to supervisor using the template provided	Template provided for a 2-4 pages long research proposal
2	Presentation of the research proposal	Out of 100 (marking scheme in pg5)	During wk 7, sem 1 (week of Monday, 22nd Oct 2018) As organised by department	Open session held in the department using 3 slides in 3 minutes flash presentation	PowerPoint or alternative format
3	A short discussion on research ethics related to 5E1 project	Out of 100 (marking scheme in pg6)	End of wk 7, sem 2 Friday, 8th March 2019	To be submitted by email to supervisor using the template provided	Template provided for a 2 page (max.) long ethical discussion
4	A research paper appropriate for peer-reviewed publication based on research carried out in 5E1	Out of 100 (marking scheme in pg7)	During revision week, sem 2 Monday, 15th April 2019	To be submitted by email to supervisor/project second marker using the template provided	Template provided for a max. 6 pages long research paper (IEEE template or alternative)

- The deadlines for all these assignments are specified by the School of Engineering and should be adhered to.
- The marks for these assignments are required to be sent to the departmental coordinator of the 5E1 module along with the marks of 5E1 (MAI research project) on or before **TBA**.

Research Proposal Document Marking Scheme

Please mark the research proposal document out of 100.

Content	Mark	Comment
PROPOSAL REPORT		
Title <i>(Appropriately reflects the nature of the work)</i>	/10	
Research objectives defined clearly <i>(with bullet points)</i>	/30	
The background and justification provided for choosing the research problem	/30	
Methodology & discussion on expected results <i>(description of how the research objectives will be achieved)</i>	/20	
References <i>(Provides citation for all sources used for the report-no plagiarism)</i>	/10	

Research Proposal Presentation Marking Scheme

Please mark the presentation out of 100.

Content	Mark	Comment
ORAL PRESENTATION		
Clarity and delivery of presentation (<i>related to speech</i>)	/40	
Use of graphical tools	/20	
Use of text (<i>font size, visibility of text, amount of text in slides</i>)	/20	
Question & Answers (Understanding & coherent explanation)	/20	

Essay on Ethics Marking Scheme

Please mark the essay out of 100.

As the supervisor of MAI research projects, we need to ensure that all research conducted under our supervision meets the required standards. The main areas of concern are:

- Use of human and animal subjects
- Potential risks to the participants or the researcher
- Effects on the environments
- Collaborations with others parties
- Confidentiality and data protection
- Barriers to informed consent
- Conflict of interests

In case, the student is conducting a purely theoretical research project which do not involve any apparent research ethics related issues, then the students will need to write an ethics statement based on a hypothetical scenario relevant to his/her field of research.

Content	Mark	Comment
Essay		
Description of the project	/10	
Description of the possible ethical issues & how these issues will be resolved	/40+/40	
Conclusion	/10	

Research Paper Marking Scheme

Please mark the research paper out of 100.

The marking of the research paper should evaluate the ability of the student to successfully communicate the value of his/her research work to a wider audience. The paper should not be marked on its technical competency as that element is already being assessed separately in the 5E1 module.

Content	Mark	Comment
Abstract	/10	
Structure and flow of the paper	/25	
Formatting and language	/15	
Table and figures <i>(Quality, appropriateness & effectiveness)</i>	/15	
Justification and scope of research <i>(Effective communication of the above in the introduction part of the paper)</i>	/15	
Discussion & Conclusion <i>(Identifying the contributions and limitations of the research work and presentation of the same to the scientific community)</i>	/20	
