

MODULE CODE AND MODULE NAME [25 credits]

5E1 : MAI Engineering Research Project

Coordinator(s):

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Module organisation

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

Module description, aims and contribution to programme

This module allows the students to complete an individual research project on a topic of contemporary engineering research interest.

The main objective of this module:

- To plan, execute and report on an individual engineering research project.

A School-wide list of project titles will be issued to students towards the end of the second semester of the Senior Sophister year. Students will be asked to rank their project preferences from one to five and allocations will be confirmed by the end of June of that year.

Learning outcomes

On successful completion of the research project and dissertation, students will be able to:

1. Contribute individually to the development of scientific/technological knowledge in one or more areas of their stream of Engineering.
2. Identify, assess and synthesize existing literature and research findings on an unfamiliar problem;
3. Apply a range of standard and specialised research tools and techniques to provide innovative and appropriate solutions to engineering problems of significant complexity.
4. Develop and apply theoretical, scientific and mathematical principles to effectively solve the research problem
5. Design and conduct unsupervised experiments and to analyse and interpret data;
6. Apply and develop software to model engineering systems;
7. Discuss and critically evaluate the research findings and reflect on the strength and limitations of the research; Assess the implications of the project outcomes for engineering practice;
8. Write a research dissertation to professional and academic standards using appropriate graphics and references;

Present complex ideas and material to peers and respond effectively to questions and criticism.

Module content

All techniques and material necessary for completing an individual research project are expected to be covered in this module.

Teaching strategies

Each individual project will be supervised by an academic staff member in the School of Engineering, and in some cases in the School of Computer Science and Statistics, and may be undertaken independently or in conjunction with a research group or in connection with

industry or another university, where circumstances are appropriate. Whenever a project involves significant collaboration with an industrial or other external partner, an external co-supervisor may also be appointed.

The students must meet their individual supervisor(s) in week 1, semester 1 or as soon as they are assigned a project title. There are no formal timetabled hours associated with the project but students are expected to spend the time it takes to make reasonable progress and to keep in regular contact with their supervisors. It is recommended that students make a formal arrangement with their supervisors to meet on a regular basis.

Assessment

The dissertation will be assessed using the following modes in the outlined streams:

(**Note:** A student will be assessed according to the stream in which they are taking the project.)

	A	B	C	C/D	D	Bio	Eng & Mgmt
Interim Report ¹	5%	15%	5%	5%	5%	15%	15%
Poster Presentation ²	5%	-	-	-	-	-	-
Final Presentation ³	5%	5%	20%	20%	20%	5%	5%
Full Dissertation ³	85%	80%	75%	75%	75%	80%	80%
Viva Voce ³	Yes	Yes	No	No	No	Yes	Yes

¹ Interim Project Report: Due by Week 12, Semester 1 - Friday 30th November 2018

² Poster Presentation: Due in Week 9, Semester 2 - Thursday 21st March 2019

³ Final project report due Friday 12th April 2019

The dissertation is examined independently by the project supervisor and a second examiner; with a third examiner and the external examiner providing moderation when required.

The following are the brief guidelines, which will be considered in assessing the final project reports:

1. **Presentation:** The project should be well structured, written in clear technical language with diagrams, well referenced and annotated. (25%)
2. **Research Work Completed:** This includes design and execution of experiments, development and/or application of software, development and application of numerical or analytical models or physical prototypes etc. (25 %)
3. **Difficulty & Understanding:** This includes understanding of the research topic, existing research done in the field and identifying the scope of proposed research in the dissertation. Consideration will be given to the difficulty of the subject and the amount of study required outside the normal curriculum. (25%)
4. **Innovation, Discussion and Conclusions:** Discussion and Conclusions should be clearly and concisely set out and read directly from the work contained in the project. Innovative solutions and contributions to the research field will be taken into consideration. (25 %)

Two copies of dissertation, prepared following the guidelines provided by college, are required to be submitted.

The A copy is read and marked by the project supervisor, while a second marker marks the B copy. The marks from both are reported independently to the coordinator. If these marks do

not agree within limits set by the School, a third examiner may be asked to assess the project independently.

The performance in viva voce examination, where conducted, will be taken into consideration while agreeing to an overall mark.

Students will be expected to follow the project report template at the end of this document.

Required textbook

https://www.tcd.ie/Graduate_Studies/currentstudents/admin/thesisregs/index.php

<http://student-learning.tcd.ie/postgraduate/topics/writing/thesis/>

Further information

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



Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

School of Engineering
Department of XXX

[Project report title]

[Your Name]

[Your student number]

April 2019

A dissertation submitted in partial fulfilment of the degree of (delete as necessary)

MAI (Civil, Structural and Environmental Engineering)

MAI (Biomedical Engineering)

MAI (Electronic and Electrical Engineering)

MAI (Electronic and Computer Engineering)

MAI (Computer Engineering)

MAI (Mechanical and Manufacturing Engineering)

MAI (Engineering with Management)

[Your Name] (student number)

Declaration

I have read and I understand the plagiarism provisions in the General Regulations of the University Calendar for the current year, found at <http://www.tcd.ie/calendar>.

I have also completed the Online Tutorial on avoiding plagiarism 'Ready Steady Write', located at <http://tcd-ie.libguides.com/plagiarism/ready-steady-write>.

Signed:

[Your Name] (student number)

Abstract

A short summary of the problem investigated, the approach taken and the key findings. This should be around 400 words, or less.

This should be on a separate page.

[Your Name] (student number)

Acknowledgements

You should acknowledge any help that you have received (for example from technical staff), or input provided by, for example, a company.

Contents

Declaration.....	i
Abstract.....	ii
Acknowledgements	iii
Contents	iv
Nomenclature	v
1 Introduction	1
1.1 Headings of sections and subsections	1
1.1.1 Subsection name style	1
1.2 Length of the report	1
1.3 Contents of the Introduction	2
1.4 Contents of the background chapter	2
1.5 The Conclusions chapter	2
2 Figures, Tables and Referencing	1
2.1 Figures	1
2.2 Tables	2
2.3 Equations	3
2.4 Referencing published work.	3
References	4
Appendix A1	5
A1.1 Appendix numbering.	5

Nomenclature

A list and explanation of symbols used is not essential, but if your project deals with a lot of quantities and/or abbreviations then it is probably a good idea.

A	Area of the wing	m^2
B		
C	Roman letters first, with capitals...	
a	then lower case.	
b		
c		
A		
B		
Γ	Followed by Greek capitals...	
α	then lower case greek symbols.	
β		
γ		
TLA	Finally, three letter acronyms and other abbreviations arranged alphabetically	

If a parameter has a typical unit that is used throughout your report, then it should be included here on the right hand side.

If you have a very mathematical report, then you may wish to divide the nomenclature list into functions and variables, and then sub- and super-scripts.

Note that Roman mathematical symbols are typically in Times Roman font in italics.

1 Introduction

This document provides a template for the preparation of final year project reports. The objective is to provide clear guidance to you, the students, and also to provide uniformity to the project reports, to facilitate equitable grading.

If you are using LaTeX a sans-serif font should be used.

If you are using Microsoft Word Calibri font should be used. The font size should be 12pt for main text. The text should be left justified. Avoid italics and bold in the main text. These font requirements comply with TCD policy on accessibility.

All chapter headings should use the “Heading 1” Style, which in this document has been set at 28pt Calibri. The font colour is “Pantone Blue”, which is the colour used in TCD documents.

The line spacing should be 1.15 with a 10pt space after each paragraph, as it is here.

The page number should appear at the bottom of each page starting at 1 on the first page of the Introduction chapter. Your name and student number should be in the centre of the header on each page, except the title page.

1.1 Headings of sections and subsections

Chapters should be divided into appropriate subsections. The sections should be numbered and the section name should be 14pt Calibri in bold (“Heading 2” style). The section should be numbered sequentially from 1 within each chapter (e.g. 1.1, 1.2, 1.3 etc.).

1.1.1 Subsection name style

The subsections if used should be numbered sequentially within each section. The name should be in 12pt Calibri. It should not be bold. You should really try to avoid using sub- subsections, but if you do they should not be numbered.

1.2 Length of the report

The page margins should be set to “Normal”, which is 2.54 cm top, bottom, left and right. There may be a table or figure for which it is sensible to deviate from these margins, but in general the main text should be formatted within the specified margins.

The body of the report should be organized into several chapters. There are a number of chapters that you must have: an introduction; a background or literature review chapter; and a conclusion chapter. The focus of the other chapters will depend on your specific project.

[Your Name] (student number)

The body of the report must be no more 60 pages for MAI. This does not include the front matter, references list and any appendices. In other words, from the first page of the Introduction to the last page of the Conclusions chapters must be less than 60 pages for MAI.

If you exceed these page limits or deviate significantly from this format, you will lose marks.

1.3 Contents of the Introduction

The introduction presents the nature of the problem under consideration, the context of the problem to the wider field and the scope of the project. The objectives of the project should be clearly stated.

1.4 Contents of the background chapter

The second chapter is typically a literature review, or survey of the state of the art, or a detailed assessment of the context and background for the project. The exact nature of this chapter depends on the topic and/or methods of the project. It is essential that the work of other people is properly cited. This will be discussed in detail in chapter 2 below. Note that you should use references wherever is appropriate through the report, not just in the literature review chapter.

1.5 The Conclusions chapter

The final chapter should give a short summary of the key methods, results and findings in your project. You should also briefly identify what, if any, future work might be executed to resolve unanswered questions or to advance the study beyond the scope that you identified in Chapter 1.

2 Figures, Tables and Referencing

It is very important to properly refer in the text to any figures, tables or previously published work that you are discussing. Adequate and consistent referencing is one of the criteria which will be used to assess your project report.

2.1 Figures

Graphs, pictures and other images should be included in your report as a numbered, captioned figure. An example is given in Figure 2.1.

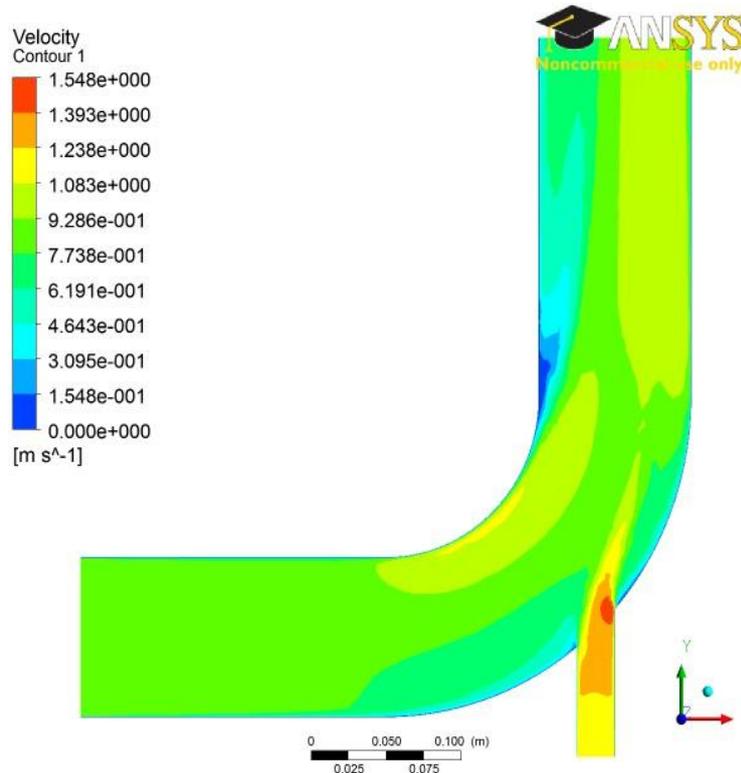


Figure 2.1 Velocity distribution on the mid-plane for an inlet velocity for case 1.

The figure and caption should be centred. The figure numbering starts at 1 at the beginning of each chapter. The caption should provide a brief description of what is being shown. The figure should appear in the document after it is referred to in the text. No figure should be included which is not referred to in the text. Ensure that the size and resolution of images imported from software are sufficient to read any text.

There are occasions when it is useful to group several related images together in a single figure. In this case, each sub-plot should be labelled (a), (b), (c) etc. and may even have a caption associated with each. An example of this situation can be seen in Figure 2.2. Even if there are captions for each sub-plot, a caption for the figure as a whole is still required.

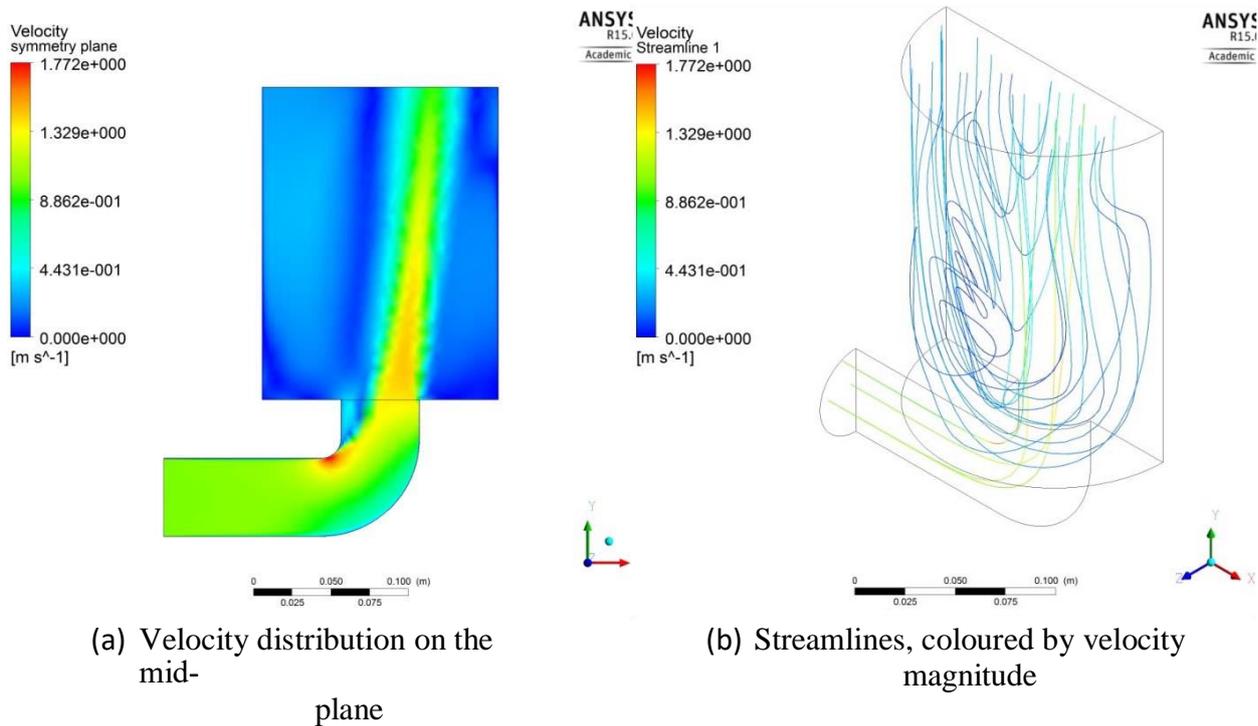


Figure 2.2 Velocity field for $V_{INLET}=1.0$ m/s

2.2 Tables

Tables are numbered in the same way as figures. Typically tables also have a short caption, but this is not universally true, as shown in Table 2.1. The number and caption appear above the table, not below as with figures. Again, no table should appear in the report which has not been referred to in the text. Tables should come after they are discussed in the text. The exact formatting of the table depends somewhat on the content of the table, but in general, the text in the table should be the same font and size as the main text. Examples of appropriate formats are shown in Table 2.1 and Table 2.2.

Table 2.1

Flow velocity (m/s)	0.25	1.0
Pressure drop (Pa)	23.5	521.7
Loss coefficient, K_L	1.74	2.03

Table 2.2 Alternative, simple table format for pressure drop based on inlet gauge pressure

Flow velocity (m/s)	0.25	1.0
Pressure drop (Pa)	23.5	521.7
Loss coefficient, K_L	1.74	2.03

2.3 Equations

All equations should be numbered sequentially. Do not restart the numbering at the beginning of each chapter. Unlike figures and tables, you may not need to refer to every equation in the text. You should take care to format equations properly. Do not simply try to use plain text. Use the equation editor. An example of how equations should appear is shown in Equation 1.

$$\operatorname{div}(\underline{u}) = \frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0 \quad (1)$$

2.4 Referencing published work

It is important to give appropriate credit to other people for the work that they have shared through publications. In fact, you must sign a declaration in your report stating that you understand the nature of plagiarism. As well as avoiding plagiarism, citing results or data from the literature can strengthen your argument, provide a favourable comparison for your results, or even demonstrate how superior your work is.

There are many styles to reference published work. For example, the parenthetical style (which is also called the Harvard style) uses the author and date of publication (e.g. “Smith and Jones, 2001”). There is also the Vancouver (or the citation sequence) style, which is shown in this document. In the Vancouver style, the publications are cited using a bracket number which refers to the list in the References section at the end of the report. The references are listed in order that they are cited in the report. A variant is name sequence style in which the publications are referenced by number, but the list is arranged alphabetically. For example, the text might say: several studies have examined the sound field around tandem cylinders generated by flow(1, 2), while other investigations have focused on the effect of an applied sound field on the flow(3). Papers from conference proceedings(4), books(5) and technical reports(6, 7) can be dealt with in the same style.

The Vancouver style has the advantage that it is a little more compact in the text and does not distract from the flow of the sentence if there are a lot of citations. However, it has the disadvantage that it is not immediately clear to the reader what particular work has been referenced.

It actually does not matter which particular referencing style is used as long as three important considerations are observed:

- the referencing style used throughout the document is consistent;
- all material used or discussed in the text are properly cited;
- nothing is included in the reference list that has not been cited.

It is strongly recommended that you use a bibliographic tool, such as EndNote, as this will facilitate compliance with these three requirements.

References

1. Fitzpatrick JA. Flow/acoustic interactions of two cylinders in cross-flow. *Journal of Fluids and Structures*. 2003;17:97-113.
2. Finnegan SL, Meskell C, Ziada S. Experimental Investigation Of The Acoustic Power Around Two Tandem Cylinders. *Journal of Pressure Vessel Technology*. 2010;132:041306 (12 pp.).
3. Hall JW, Ziada S, Weaver DS. Vortex-shedding from single and tandem cylinders in the presence of applied sound. *Journal of Fluids and Structures*. 2003;18(6):741-58.
4. Jordan P, Fitzpatrick JA, Meskell C, editors. *Array Beampattern Control for Measurement of Propeller Noise*. 7th AIAA/CEAS Aeroacoustics Conference; 2001: AIAA.
5. Paidoussis MP, Price SJ, Langre Ed. *Fluid-Structure Interactions (cross-flow-induced instabilities)* New York: Cambridge University Press; 2011.
6. Reyes LA. *Power Uprate Program Status Report – SECY-07-0090*. U.S. Nuclear Regulatory Commission, 2007 May 2007. Report No.: ML070930101.
7. IEA. *Technology Roadmap - Geothermal Heat and Power*. Paris: IEA; 2011.

Appendix A1

You may use appendices to include relevant background information, such as calibration certificates, derivations of key equations or presentation of a particular data reduction method. You should not use the appendices to dump large amounts of additional results or data which are not properly discussed. If these results are really relevant, then they should appear in the main body of the report.

A1.1 Appendix numbering

Appendices are numbered sequentially, A1, A2, A3.... The sections, figures and tables within appendices are numbered in the same way as in the main text. For example, the first figure in Appendix A1 would be Figure A1.1. Equations continue the numbering from the main text.