On-line course materials

# MATH30022 - Project - Semester 2

**Year:** 3 - **Semester:** 2 - **Credit Rating:** 10

## Aims

The aim of this option is to give third and fourth year students an opportunity to research a chosen mathematical topic in some depth and to improve their communication skills through producing a written account and giving a short verbal presentation on the topic. Every M.Math student must take this option in the 4th year of study. All students may take this option in the 3rd year of study. It provides opportunities to develop transferable communication and time-and task-management skills, through researching the topic and organising and producing a written account and a short presentation.

## Brief Description

Supervision

The role of the supervisor is to give guidance, initially and as the project develops, to make you aware of the standard and quantity of work desired, to comment on the general shape of your report and to give a certain amount of detailed feedback, for instance on a sample or draft chapter. For 2 semester projects the student is expected to submit a piece of work to the Teaching and Learning office by the 1 semester project deadline in January. This will typically be an early chapter of the project or a description of what the project will eventually contain. This interim submission will not form part of the examination, but will ensure you are making adequate progress and are comfortable using LaTeX. It will also enable you to discuss with your supervisor, possible improvements to your writing style and presentation. Each project is different, and the frequency of meetings should be determined between you and your supervisor as the project progresses. It is usual to meet with your supervisor every two weeks initially to discuss progress, ideas and methods. However, you are encouraged to work independently and show initiative and creativity and the main responsibility for progress lies with you. If you are stuck or unclear about where you should be heading then you should contact your supervisor: do not postpone this because the deadline seems far away.

General guidelines

Different types of project:

Broadly, projects can be divided into several types:

Reading several sources and presenting some mathematical ideas. The mathematics is expected to be correct and substantial, and the presentation coherent.

Investigating a mathematical or statistical model using numerical/statistical methods.

Developing some new mathematical ideas or details, where statements and/or proofs are not in the literature. Compared to the previous types, the amount of mathematics can be less, but should be no less accurate.

Essay style projects - for example a historical project. The amount of actual mathematics would be lower, but there should be a correspondingly greater amount of analysis and criticism.

Other types of project are also possible, and many projects will be a combination of more than one of these aspects. A mark of 100% would be obtainable for a perfectly written project which a student has done mostly independently and is sufficiently novel that the content could be published in a respectable journal (probably after being suitably rewritten).

What is expected

This varies according to the type of project.

Length: There is no set length, and it depends on the 'density of the content'. As a rough guide, projects tend to be about 25 pages per 10 credits. If there are many diagrams, or much computer code then this should be increased by a corresponding amount, and essay style projects should also be a little longer.

Structure: Title page, Introduction, Table of Contents, Main body, Conclusion, Appendix, References (see below for more details)

Correct English: Grammar, punctuation and spelling are important. Notice that in all books and research papers you read, the mathematics is punctuated properly, and displayed equations end in a full stop where appropriate. The book by Higham [1] (listed in the bibliography below) is an excellent manual for writing mathematics.

Typesetting: All projects must be typeset on the computer although diagrams may be added by hand. You will also be expected to submit a pdf version, which may exclude the diagrams if they are hand-drawn. See below for more details.

Plagiarism

Plagiarism is simply passing someone else's work off as your own, and is considered a serious offence. In mathematics, copying a definition or the statement of a theorem is not considered plagiarism. But for a long proof, it is much better to read it, absorb it and then write it in your own words, perhaps adding extra details. If there is something you want to copy more or less verbatim (perhaps a proof), then make sure you quote the source so you are not passing it off as your own. The electronic online submission will be used to check for plagiarism. See University guidelines on plagiarism.

Originality

Writing a project is like telling a story, and there are various ways you can put a bit of originality into a mathematics project.

There might be details in a proof you don't understand at first reading, so when you write it add some details which would have helped you. Also where the original author has written "clearly, ..." you could add a justification of this point - why is it clear?

A simple way to add something of your own is to add examples illustrating a definition or a theorem, or showing that a particular hypothesis is needed.

If you are reading from a text book that has exercises, then solve some of these exercises at the appropriate place in your project.

In numerical work, you can investigate a system or aspects of a system that have not been studied before.

Like telling a story, it's how the facts fit together in a narrative that makes it your own.

Finally there is the indisputable originality of proving a new result that cannot be found in the literature, or giving a significantly different proof of an existing result. Such a possibility is most likely to arise from suggestions by the supervisor.

Word processing

There are two types of software suitable for writing the project. Firstly the wysiwyg type such as MS Word or OpenOffice.org, both of which have equation editors though both have their limitations. The other type is LaTeX, which is the ideal for writing a large amount of mathematics - it has a steeper learning curve than the wysiwyg variety, but is usually worth the effort. If you are thinking of working in a research environment, then it is even more worthwhile investing the time to learn LaTeX. The School also has a limited number of licences for Scientific Word, a package providing a user-friendly front end to LaTeX. Whatever software is used to write the project it must be capable of producing machine readable pdf, needed for the online submission.

Structure

The project must begin with a title page showing the title, author (you!), your student ID number, your supervisor's name, and the course code.

A table of contents while not essential is very helpful for the reader.

An introduction, giving an overview of the project and its context, and perhaps mentioning prerequisites (such as saying, "the reader should be familiar with a first course in linear Algebra"). Often an introduction will contain a paragraph or so describing briefly what is done in each chapter.

The main body should be divided into sections or chapters, rather than being a continuous stream of ideas.

Possibly a conclusion, summing up the most important aspects. This is often a good place to show an overall understanding.

'Appendices" if relevant, giving for example computer code.

Bibliography. This should include in all the texts you have made use of during your project, including websites. Reference to websites should include the date of access, just as reference to a book should include the edition number if there's more than one. It is a good idea to collect this information as you progress, rather than trying to remember at the end which sources you used (usually an impossible task). There are several different acceptable styles for bibliographies, and looking in books or research papers will help.

## Teaching & Learning Process (Hours Allocated To)

| Lectures | Tutorials/ Example Classes | Practical Work/ Laboratory | Private Study | Total |
|---|---|---|---|---|
| 0 | 0 | 0 | 100 | 100 |

## Assessment and Feedback

Oral presentation and examination

There will be an oral examination for every project and this will take place after the submission deadline and will be scheduled by your supervisor. This exam should begin by the student giving a short (10-15 minute) presentation on the project, which is followed by questions from the examiners. The main purpose is to test understanding. The presentation can be delivered with chalk and blackboard, with overhead transparencies or with a computer presentation. The latter two need a bit more organization, so please ensure you give the supervisor adequate notice of which method of delivery you prefer. In such a short presentation, you will not be able to cover all the details of the project, so do not try. It is better to give a short overview describing what you find are the most interesting points, and perhaps selected details.

Students who fail to attend the oral examination without good reason, will see a reduction of marks for Understanding.

Awards of marks

Marks for all projects are awarded under 5 principal categories (but not every criterion here is relevant to every project):

Structure (10%) Well written introduction and possibly conclusion; bibliography; overall organization of material

Presentation (25%) Precise and effective communication; Clarity of writing and exposition; explanation and coherent use of notation; clearly written equations

Accuracy (20%) Precise mathematical arguments; consideration of accuracy in use of numerical methods;

Initiative (20%) Originality; Independent work; Individual expression and critical writing; Independent use of library;

Understanding (25%) Appreciation of the meaning, context and significance of the work.

While 'quantity' is not explicit in this list, lack of content would be reflected in low marks across all 5 categories.

## Further Reading

[1] N.J. Higham, Handbook of Writing for the Mathematical Sciences, 2nd ed. Society for Industrial and Applied Mathematics (SIAM), Philadelphia, 1998. ISBN 0-89871-420-6.

## Staff Involved

Mr Michael Tso - Lecturer

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