

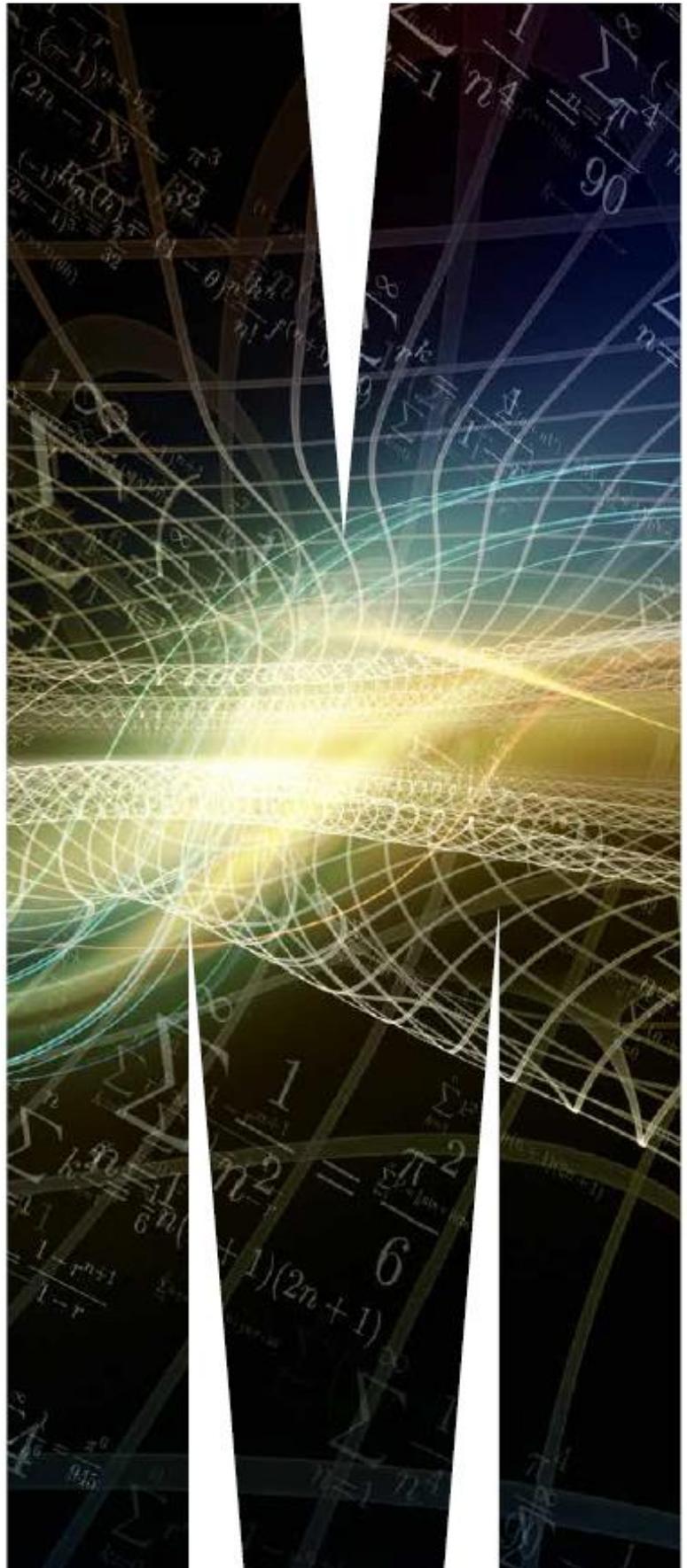


MONASH  
University

# School of Mathematics

Honours handbook  
2022

MONASH  
SCIENCE



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# Applying for Honours

## Entry Requirements and Enrolment

The normal minimum requirement for honours (fourth year) in mathematics is:

- i. an average of at least 70 in 24 points of relevant third year units, or equivalent\*
- ii. a willing supervisor for your honours project before the end of the first week of December of the year before commencing your honours degree.

## How to apply

1. Read the list of potential honours projects and supervisors: School of Mathematics Honours Projects (PDF, 0.15 MB). This will generally be posted on the School's website in mid-August each year, for projects starting the following year.
2. During late August-mid-November, contact potential supervisors and arrange to discuss the projects that they are offering. Ensure that you come prepared (i.e. an idea of your research interests and what you want from honours, a print out of your academic transcript from WES) to the meeting. Develop a project title and outline with your project supervisor. Do not hesitate to contact a potential supervisor even if he/she has nothing offered officially. Oftentimes, academics have many projects available.
3. Make an appointment with the Honours coordinator. Bring your academic transcript and your project form to your appointment.
4. Complete the Faculty of Science Online Honours Application.

## Honours structure

Honours students are enrolled in two 24-point units MTH4100 – Mathematics Research Studies and MTH4200 – Advanced studies in Mathematics

### **MTH4100 – Mathematics research studies (24 points)**

M40110 - Writing and Presenting for Honours (3 points)
<b>Research project (15 points)</b>
One honours lecture unit (6 points)

### **MTH4200 – Advanced studies in mathematics (24 points)**

A combination of lecture units that make up to 24 points. This can include a number of 4-point units\* with permission from Honours coordinator and project supervisor.

Note:

1. It is the student's responsibility to ensure that sufficient units are taken to meet the points requirement.
2. Students must have permission from the honours coordinator before enrolling in 4-point units\*.
3. If students take more than 24 points, the best weighted 24 points will be used as the final mark

\*see page 4 for information about 4-point units

# Honours research project

The form of the research project is decided by the supervisor depending on whether the project requires any extra reading or new skills. The focus of each research project will vary. Some research projects will have a higher computational focus, while other projects may be more reading and/or proof based.

The research project should have a research objective that has not already been developed in the literature. This does not mean that the research project needs to result in publishable material. It can consist of a minor variation of a known result that has not been published before. For example, a generalization/extension of a result that an expert could establish on their own, but instead leaves as an exercise for the readers of a paper to complete. The research project can also be in terms of new insights into a possibly well-established area, rather than a genuinely novel result.

## **Assessment for Research projects**

1. Intermediate report (25% of project mark). The due date is at the end of your first semester's exam period, with exact date to be posted on moodle.  
Comprising of a literature survey, and discussion of any new mathematical techniques that you needed to complete the project.  
Recommended length: 10-20 pages.  
Assessed by supervisor(s).

2. Final report: (60%) Due 4pm last Friday of your second semester.  
Recommended length: 25-40 pages.

Assessed by two staff members of the School (other than the supervisor).

The final mark will be based on the degree to which the student is able to reach the objective by the end of the project, or is able to detail scientific reasons for why the planned objective was not achieved

3. Oral presentation: (15%). During swotvac, second semester. Assessed by all staff who attend the Honours presentations.

## **Notes about the research project**

The time you spend on the intermediate report and the project should be similar to the time spent on the equivalent (credit points-wise) number of lecture topics. You should start your intermediate report and project at the beginning of your first semester. You should meet with your supervisor regularly as soon as the teaching semester begins, eg: weekly.

Late submissions for Assignments and Reports will be penalised with 10% per day or part thereof late, including weekends. Work submitted more than 1 week late without special consideration will not be marked except in exceptional circumstances. This is in accordance with the Faculty of Science policy: <http://intranet.monash.edu.au/science/staff/education/policies-procedures/late-submission.html>. Students who cannot submit work by the due date because of illness or other special circumstances are covered by the special consideration policy.

Keep copies of all your submissions for your own records.

# Honours lecture topics for 2022

You can select lecture units from any group, as long as the requirements of your enrolled honours units are met. You can add units until the end of week 2. You can discontinue units until the end of week 8.

## Semester 1

[Writing and Presenting for Honours \(3 points\)](#) **Compulsory for all honours students**

[MTH5089 - Computational statistical inference \(6pts\)](#)

[MTH5099 - Measure theory \(6pts\)](#)

### Pure mathematics topics

[MTH5143 – Representation theory \(6pts\)](#)

[MTH5153 - Combinatorics \(6pts\)](#)

### Stochastic lecture topics

[MTH5210 - Stochastic calculus and mathematical finance \(6pts\)](#)

[MTH5220 - The theory of martingales in discrete time \(6pts\)](#)

### Applied mathematics topics

[MTH5311 - Methods of applied mathematics \(6pts\)](#)

[MTH5321 - Methods of computational mathematics \(6pts\)](#)

[MTH5343 - Magnetohydrodynamics and visualisation of scientific data \(6pts\)](#)

## Semester 2

### Pure mathematics topics

[MTH5113 - Low-dimensional topology \(6pts\)](#)

[MTH5121 – Analysis on manifolds \(6pts\)](#)

M41240 – Complex analysis (see Greg Markowsky for details) (6pts)

### Stochastic lecture topics

[MTH5230 - Markov chains and random walks \(6pts\)](#)

[MTH5240 – Mixing of finite Markov chains \(6pts\)](#)

### Applied mathematics topics

[MTH5323 – Numerical analysis and control of differential equations \(6pts\)](#)

[MTH5331 - Optimisation for data analytics \(6pts\)](#)

### Other topics – only with approval of Honours coordinator

- AMSI Summer School units can count as credit towards your honours degree. Either one 4-week course or a two 2-week courses (6 points).
- External honours units via AMSI Advanced Collaborative Environment (ACE)  
<http://higher.ed.amsi.org.au/ace-hons-courses/> (4 points).
- Some third-year ASP3xxx, ATM3xxx or MTH3xxx mathematics lecture units (4 points each). An additional 2 points worth of extra assessment must be arranged.
- Honours may also enrol in one relevant non-shared 5<sup>th</sup> year unit for credit but must have the permission of both their supervisor and the Honours Coordinator. (6 points).

For permission to enrol in any of these, contact the Honours Coordinator at least three weeks before the start of the unit.

## Honours prizes

All students enrolled in honours in the School of Mathematics are eligible for the following prizes:

### **Leo Gleeson prize**

Prize for the best honours student completing the Applied Mathematics honours program.

### **Carl Moppert prize in Mathematics**

Prize for the best all-round Mathematics honours student.

### **Pure Mathematics prize**

Prize for the outstanding honours student in Pure Mathematics.

### **Statistics prize**

Prize for the best honours student in statistics.

## Contacts

**Honours Coordinator** Dr Julie Clutterbuck

E: [julie.clutterbuck@monash.edu](mailto:julie.clutterbuck@monash.edu)

**Deputy Honours Coordinator** Dr Andy Hammerlindl

E: [andy.hammerlindl@monash.edu](mailto:andy.hammerlindl@monash.edu)

**Pure Mathematics Advisor (Honours)** Dr Dan Mathews

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**Applied Mathematics Advisor (Honours)** Dr Janosch Rieger

E: [janosch.rieger@monash.edu](mailto:janosch.rieger@monash.edu)

**Statistics Advisor (Honours)** A/Prof Jonathan Keith

E: [jonathan.keith@monash.edu](mailto:jonathan.keith@monash.edu)

**Administrative Officer (Honours)** Ms Karen Hogeboom

E: [karen.hogeboom@monash.edu](mailto:karen.hogeboom@monash.edu)

# Appendix

## Writing and Presenting for Honours

Lecturer(s): Dan Mathews

Contact details: daniel.mathews@monash.edu

M40110 is a compulsory topic for ALL honours students in Mathematical Sciences. There will be an introductory lecture, but most of the work will be a study guide that needs to be read through, along with practical reports and presentations

**Objectives:** Proposed topic is to give honours students guidance and feedback on presenting and writing mathematics, prior to their Intermediate report and presentation at the end of the first semester of study. Also to teach students LATEX, BibTEX and Beamer, however guidance on writing and presentation style will be hopefully be technology independent.

### **Syllabus:**

Technical Aspects:

1. LATEX and BIBTEX software.
2. Structure of BibTeX, LaTeX and Beamer documents.
3. Managing and citing references using BibTeX.
4. Writing mathematics in LaTeX.

Writing:

1. Structure of documents, e.g. reports, papers, theses, presentations.
2. What to include and referencing.
3. Writing Introductions, Conclusions and Abstracts.
4. Equations: formatting, e.g. spacing, inline vs display equations, multiple line equations and subequations, when to include equation numbers and referencing.
5. Tables and figures: guidelines, e.g. should always be discussed in text and captions.
6. Table of Contents.
7. Appendices.

Presenting Mathematics:

1. Audience awareness.
2. Timing.
3. Content: how much and what to include.
4. Know your audience.
5. Handling questions.

### **Mode of Delivery:**

Self-paced Study Guide with good and bad initial presentations and examples.

### **Assessment:**

Practical presentations, e.g. 10MT (4 slides or less) with feedback.

10 page report on classical paper with feedback.

Pass/Fail (will be assessed in mid-semester and final reports and presentations).

### **References:**

Fowler's Modern English Usage.

Higham, N.J., Handbook of Writing for the Mathematical Sciences, SIAM, 1998.

Krantz, S.G., A Primer of Mathematical Writing, AMS, 1997.

LATEX tutorial material, <http://www.ctan.org/topic/tut-latex>

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