COMP90044 Research Methods
Draft 0.10, 19th July 2017.
Co-ordinators: Justin Zobel and George Buchanan

Contact: Up to 36 hours of lectures and workshops

Audience: For research postgraduates (Masters or PhD). Likely to appeal to new postgraduates.

Semester: 2.

Syllabus Outline

The syllabus consists of three parts.

All students undertake Part 1. In part 2, you take 2a if a masters student, or 2b if studying a PhD. Part 3 focuses on topic specific issues for MSc(CS), MIT and PhD (Computer Science) students.

1. *Foundations* undertaken by all students.

2a. *Minor Thesis* for all MSc students.

2b. *Major Thesis* for all PhD students.

3. *Experimental Research* for both MSc and PhD students in technical subjects.

You will undertake the foundational subjects, and every other strand for your degree.

Part 1: Foundations - All students
This part of the programme is studied by all students, for all specialisms. It provides the foundational material for all research in science in general and computing and information systems in particular.

Writing about research: The ultimate aim of any research project is to have some document (a thesis, paper, or report) that explains the work and its outcomes, in a form that makes the work understandable and credible. Achieving this form involves understanding the scientific approach to thinking and arguing. This lecture concerns the typical content of a research report, writing style and writing skills, how to use writing to drive and define a research program, and the stages of the writing process.
Lecturer: Justin Zobel. (3 hours lectures and 2 hours workshops)

Reading and assessing literature: New research builds on other work, and is only of value if it provides novel results, methods, information, or illumination. Demonstrating that work is indeed new is a key part of any research project, and involves reading and assessing the existing literature. This lecture concerns how to approach and assess the literature, and how to incorporate this assessment into your work.

Lecturer: Justin Zobel. (1 hour lectures)

Research presentations: Research presentations aims to give students skills in preparation and delivery of talks or seminars for a research audience. The lecture focuses on the skills needed to effectively communicate a complex idea to other computer scientists.
Lecturer: Justin Zobel. (1 hour lectures plus several hours practice talks)

Research management: Students (and others) often fail to complete their research program in the allotted time. This lecture presents tips, techniques, and ideas for managing a research project effectively and ensuring that you deliver a high-quality thesis or project on time.

Lecturer: James Bailey. (1 hour lecture)(2 hours workshops)

Library Skills Effective research needs to be built on a foundation of high-quality information. We introduce a range of skills to exploit library resources and to handle the material you discover, reducing the time-cost of literature research, and improving the impact of previous research on your own work.
Lecturer: to be announced (2 hour lecture time)

Research Conduct: An introduction to ethical issues for researchers, including perspectives on plagiarism and research ethics and an overview of Australian guidelines for the practice of research. The lecture includes perspectives on different kinds of good and bad research.
Lecturer: Justin Zobel. (2 hours lectures)

Research Focus Guest lecturers will introduce their own experience of research, connecting what they do with the methods explained in the rest of the subject.
Lecturer: Various. (three 1 hour lectures)

Part 2a: Minor Thesis - MIT, MIS and MSc(CS)
This strand of material is undertaken by those doing an MSc in a computing discipline. It includes:
Doing a Minor Thesis An overview of undertaking a thesis, from how to create a research question, to completing a thesis submission. How to connect the different stages of research together – e.g. progressing from deciding a goal to creating a concrete research process – is explained, and the assessment criteria and desirable content of a thesis are explained.
Lecturer: Justin Zobel (1 hour)

Workshop A workshop will support your learning of analytical and writing skills, including critiquing existing material and explaining your own work.
Lecturer: Various (2 hours)

Part 2b: Major Thesis - Information Systems and Computer Science PhDs
The Phd Process We explore the structure of the PhD timeline and how you progress between one phase and the next. We explain the key milestones that mark your movement

between phases. The final organisation and content of a thesis are portrayed in detail.
Lecturer: Alistair Moffat (2 hours)

Planning Research Good quality research requires planning. We consider the overall PhD process in more detail, looking at the key planning tasks for the thesis as a whole and for individual studies or experiments. The connection between thesis work and research in general is explained, describing how a thesis represents a demonstration of real-world research skills.
Lecturer: James Bailey (1 hour)

Reviewing Reviewing and refereeing is a critical research activity. The lecture will overview the paper refereeing process and outline the expectations and obligations of referees in the field of computer science.
Lecturer: Lars Kulik. (1 hour)

Statistical Hypothesis Testing A classical method for rigourous testing of a hypothesis is the use of analytical statistics. We consider the connection between research questions and preparing data for analysis, and later turn to how to conduct statistical tests on appropriate data. Lecturer: Ben Rubinstein (2 hours)

Part 3: Experimental Research - MIT, MSc(CS) and Computer Science PhD
Empirical research: Most research projects involve some form of experimentation. This lecture discusses how to approach experiments in the context of scientific research. Topics include the purpose of experiments, experimental design, and analysis of outcomes.
Lecturer: Justin Zobel. (2 hours lectures)

Workshops (Experiments) A workshop will explore the practicalities of undertaking empirical and experimental research.
Lecturer: Various (2 hours)

Generic Skills:

- Be able to effectively write and speak about research.
- Be able to plan a program of research.
- Be able to critically assess the quality and value of published research.
- Have understanding of professional and ethical responsibilities of researchers, and commitment to them.

Assessment:

- A literature review on a chosen research topic. (10%)
- A revised literature review on a chosen topic. (20%)
- Two research paper reviews. (20%)
- Deliver a presentation on a research topic. (20%)

- A detailed research plan, focusing on research questions with justifications, and discussion of plausible outcomes, with an experimental design (30%)

Late submissions. All work is due at a time that will be made explicit on the assignment specification. The late penalty is 20% of the available marks for that assessment for each day (or part thereof) overdue.

Requests for extensions on medical grounds will need to be supported by a medical certificate. In general, extensions will not be granted if the interruption covers less than 10% of the project duration.

Students who experience difficulties due to personal circumstances are encouraged to make use of the appropriate University student support services, and to contact the lecturer, at the earliest opportunity.

No student will have more than one submission marked for each assessment. If you make both on-time and late submissions, please see the lecturer as soon as possible to determine which submission will be assessed.

The University provides a range of support services for students experiencing personal difficulties, and in some cases can assist with management of study load. Please make use of these services if you have any concern about the impact of outside factors on your ability to undertake your studies.

Academic honesty. All work is to be done on an individual basis. In cases of cheating, both parties–receiver and giver–will be referred to the School of Engineering under the University Discipline procedures. For further information, see http://academichonesty.unimelb.edu.au/. All material should be appropriately referenced, and quoted if any other person's work or text is reused. Any breach of this protocol will be referred to the School of Engineering under the University Discipline procedures.

Textbook:
Justin Zobel, *Writing for Computer Science*, Third ed., Springer, 2015.

Recommended Texts:
David Evans, Paul Gruba, Justin Zobel *How to Write a Better Thesis*, Third ed., Melbourne University Press, 2014.
Paul Gruba and Justin Zobel *How to Write a Better Minor Thesis*, Melbourne University Press, 2014.

For full details and links to online material, please refer to the LMS.