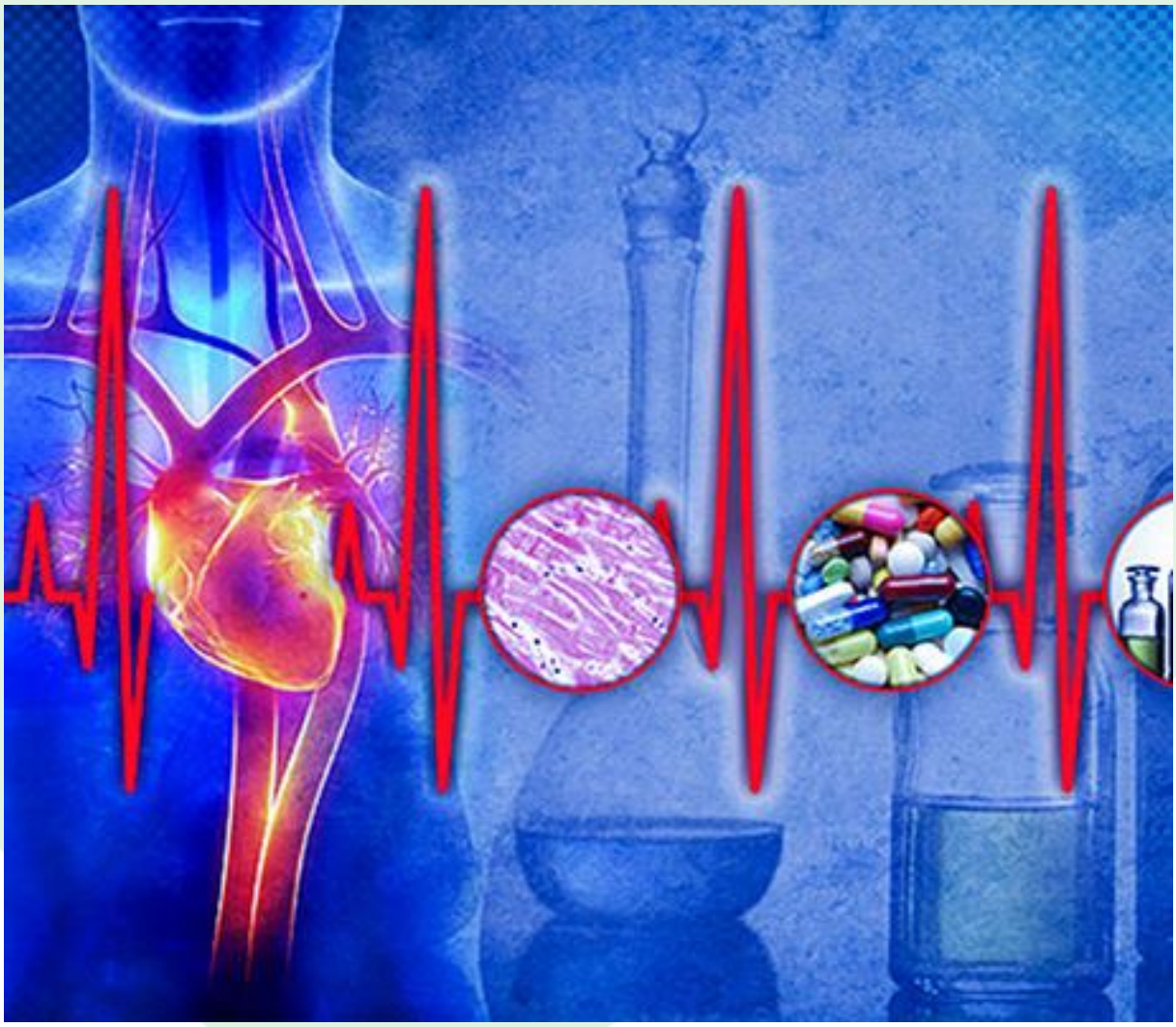
BIOM9021

Masters Project (Half Time)

Term 3, 2022



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Matthew Brodie	thesis.biomedeng@unsw.edu.au	by appointment	Samuels Building 515c	
Tianruo Guo	thesis.biomedeng@unsw.edu.au	by appointment	Samuels Building 515	

School Contact Information

Student Services can be contacted via unsw.to/webforms.

Course Details

Units of Credit 6

Summary of the Course

The biomedical engineering Masters Project allows coursework Masters students to experience research training either within the School or with collaborating institutions such as hospitals and CSIRO. Projects are selected by the student in consultation with a supervisor conducting research in an area of interest to the student. If the research topic selected is external to the School/University, the student must arrange for an internal GSBmE co-supervisor/assessor. The BIOM9021 project is conducted over 1 term and contributes half of a student's normal full-time load. Projects are assessed on the basis of a project report in the format of either a thesis or a research paper ready for submission to a refereed journal. An oral or poster presentation may be also required. Performance in this course is graded.

BIOM9021 is the second half of the 12 UOC research project. BIOM9020 is the first half. Enrolment in these courses allows a student to undertake the equivalent of BIOM9914 Masters Project over two terms. You must discuss the research project with your supervisor and get thier approval prior to enroling in this BIOM9020. Satisfactory performance in BIOM9020 will enable you to then complete BIOM9021.

Course Aims

This is the course for the postgraduate masters research projects to be undertaken over 2 terms. BIOM9020 plus BIO9021 consists of a total of 12 UOC. It allows coursework students to experience research training either within the School or with collaborating institutions. Candidates should complete the thesis proposal form (see GSBmE website) in consultation with a GSBmE supervisor who will act as their supervisor. A second co-supervisor/assessor must also be nominated on this application. All thesis proposal forms must be approved by the Head of School.

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Evaluate and critically review the scientific literature	PE1.1, PE1.2, PE1.3, PE1.4, PE1.5, PE1.6
2. Write a scientific report and communicate scientific findings to an educated audience	PE3.1, PE3.2, PE3.3, PE3.4, PE3.5
3. Design, carry out, analyse and report on research tasks	PE2.1, PE2.2, PE2.3, PE2.4

Teaching Strategies

Your supervisor will guide you through the thesis research plan that you develop as part of this course including a review of the literature, research components and scientific report writing.

Assessment

Your scientific manuscript for BIOM9021 will be assessed by (i) your supervisor and (ii) and independent assessor. Your scientific manuscript mark will be the average these two assessors. In case the difference between your two assessors is greater than 10 marks the convenor will moderate. The final grade will be the weighted average of your assessments from BIOM9020 (20%) and BIOM9021 (80%). You will receive the same grade for both courses upon completion of BIOM9021.

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Scientific Manuscript	100%	Tuesday Week 11 at 11:59 pm	1, 2, 3

Assessment 1: Scientific Manuscript

Assessment length: 5000 words (+-10%) excluding the abstract, acknowledgements and references, tables, figures, legends, in-text citations, supplementary data.
Submission notes: Please submit using the form on Microsoft Teams
Due date: Tuesday Week 11 at 11:59 pm

The objective of this report is to summarise the results of your thesis journey in a format suitable publication in a scientific journal. The report highlights the problem you're trying to solve, your project aims, justification of aims and methods with a literature review, the methods used to solve the problem, the results of your experiments, and a discussion of those results in context. This document will be in the format of a research paper for publication in a scientific or engineering journal. These papers are concise, whilst ensuring enough information to replicate the work is provided, and so as an author you need to be selective with which information to include. The guidelines should be followed, unless your planning to submit to a journal.

Assessment criteria

Structure

Project Manuscripts must include the following:

1. Title Page,
2. Abstract,
3. Statement of Contribution
4. COVID-19 Impact Statement
5. Acknowledgements,
6. Introduction,
7. Methods,
8. Results,*
9. Discussion*
10. Conclusion.
11. References,
12. Supplementary Data (optional).

Figures and Tables should be integrated at appropriate places in the text, as per instructions below.
*Students can combine results and discussion if it is commonly performed in their field.

Title Page

The title page should contain the following:

- Title: The title should contain no more than 150 characters (including spaces) and clearly indicate the subject matter of the paper.
- Student's Name.
- Supervisors' Names and Titles.
- Running Title: A running title containing no more than 50 characters (including spaces) is required.
- Key Words: Three to Five key words should be provided.
- Word Count: The word count excluding abstract, statement of contribution, acknowledgments, references and figure legends should be listed.
- Abbreviations: list all abbreviations used

Abstract

An abstract of up to 250 words should follow the title page. The abstract should provide the background for the study, experimental approach, major findings and conclusions. It should be understandable without reference to the rest of the paper. References may not be cited.

Statement of Contribution

The statement of contribution should specifically identify the components of research undertaken by the student. To do this, indicate which aspects of the research results or engineering designs included in the project manuscript were done in collaboration with, or undertaken by, other members of the research group or by external collaborators. Note that work done by others must be limited to steps that would enable the student to undertake their project, not the project themselves. Examples of this may include (but not limited to):

- Some surgeries being undertaken by more experienced lab colleagues.
- Tissue cultures being maintained or processed by lab assistants.
- Survey response or patient databases generated or analysed in whole or partly by others.
- A subsection of the same experimental data obtained by lab colleagues from a previous study.
- Procedures being outsourced to an external company.
- Design elements contributed by your supervisor or other students.
- Utilising results or models generated by previous research students.

It must be obvious from this section that the student's contribution is the vast majority of the work described in this paper. The supervisor must sign this. Seek advice from your supervisor if you are unsure about this.

COVID-19 Impact Statement

If your research project has been impacted by COVID-19 in any way (e.g. extended lockdown, selfisolation orders etc), then use this space to detail exactly how this has affected. This section should be 0.5-1 page long. This section will discuss any changes in circumstance that have affected your thesis results (e.g. lab shutdown). Supervisors and Assessors are to take this into consideration when marking.

Acknowledgements

The author should acknowledge those who have provided funds, reagents, technical guidance and/or training and scientific advice.

Introduction

The introduction should give a clear account of the background for the study, and the research objective or hypothesis tested should be stated. The introduction should be understandable to a non-specialist. Introductions should be written in a “funnel” style: It begins with the general, global problem that is to be addressed. Usually this is the disease or ailment that your research may eventually impact, a product or procedure that will be improved, or the fundamental scientific question/gap knowledge. Each subsequent paragraph becomes more and more specific, each outlining the need for the research with the aid of references, with the final paragraph revealing the aim of the research, the research hypotheses, and outlining the contents of the report. For a guideline on writing a hypothesis, please refer to the resources section.

Methods

The methods must be described in enough detail to allow the experiments to be interpreted and repeated by an experienced investigator. Give references to established methods, provide references and brief descriptions for methods that have been published but are not well known; describe new or substantially modified methods. Identify the apparatus, drugs and chemicals used, give the manufacturer’s name and address in parentheses after each item. Describe the statistical methods used and define all statistical terms, abbreviations, and symbols. Clear justification must also be provided for the statistical tests chosen. Specify the computer software used. Where appropriate, describe your selection of the subjects (patients or laboratory animals, including controls), identify the age, sex, strain, number used and other important characteristics of the subjects. If animals are used, a statement of compliance with the NHMRC code and UNSW ACEC approved (or other relevant institution approved) ethics project number must be included in the methods. If human subjects or tissues are used, the UNSW HREC or HREA project number must be cited.

Results

Present your results in logical sequence in the text, tables, graphs and illustrations. The description of the experimental results should be succinct, but in enough detail to allow the experiments to be analysed and interpreted by the reader. Where group data is presented, the averaged or median results with some measure of variability (standard deviations, confidence intervals, standard errors of the means), along with the number of observations, observed power, effect sizes and statistical significance, should be given as appropriate. The rationale for performing the experiments may be briefly mentioned in the Results section, but conclusions or interpretation of results should not be presented. Do not repeat in the text all the data that is presented in the tables or graphs. Headed paragraphs maybe used to aid in the presentation of the results.

Work which is integral to the manuscript that has been performed by others should be referenced in the manuscript but not treated as the student’s own work and identified as such in the manuscript. This should also be clearly disclosed in the Statement of Contribution and Methods or Results as appropriate.

Discussion

In the discussion explore possible mechanisms or explanations for the findings of your study, compare and contrast your results with those from other relevant studies, state the limitations of the study, and explore the implications of the findings for future research. Do not repeat in detail data or other material

given in the Introduction or the Results sections.

Conclusions

Provide a one paragraph conclusion to your research. This is not a copy of the abstract, rather it is a succinct summation of your results and whether your hypotheses were proven or disproven, with a short explanation why.

References

Refer to your supervisor for an appropriate referencing style, as these are usually journal and discipline specific. As a guide, many engineering reports using IEEE Numbered or Harvard. Whichever style you use, ensure that it is consistent throughout. References should be listed here in the order dictated by the referencing style. References must all be cited in-text (and vice versa).

Tables

Each table should be given on a separate page integrated at an appropriate position within the text. Tables are numbered consecutively according to the order in which they have been first cited in the text. Tables should be numbered with Arabic numerals and the number should be followed by a brief descriptive title at the head of the table. Tables should be self-explanatory, with necessary descriptions provided in footnotes underneath the table. Give each column a short or abbreviated heading. Tables must be cited within the text, e.g. “The results from the study (Table 1) show a decrease in attention span over time”.

Figures and Legends

Each figure should be given on a separate page, integrated at an appropriate position within the text. Figures should be numbered separately with Arabic numerals in the order of occurrence in the main text. Figures and panels within figures should be laid out for optimal visibility when printed on A4 paper, either in the one-column (half-page width) or two-column (full-page width) formats. When appropriate, graphs should include error bars. A description of the statistical treatment of error analysis should be included in the figure caption. Figures should be numbered consecutively according to the order in which they have been first cited in the text. Figure legends can appear below the figure and/or on a separate page. Each figure should be given a title and a legend that explains the figures in enough detail that, whenever possible, they can be understood without reference to the text. All symbols and abbreviations should be explained within the legend. If a figure has been published, acknowledge the original source.

Supplementary Data

Material needed for an in-depth evaluation of the work, but which does not fit well in manuscript format, should be included as Supplementary Data. These data should only be included if they provide material that further supports or substantiates the results presented or summarized in the main manuscript but would not be able to readily fit in the main text. They should be summarised and referred to in the main text and should not be essential for the understanding of the manuscript nor for the major conclusions. Do not include extra observations or literature review in the supplementary material. Supplementary data should be as brief as possible, and/or submitted as a separate pdf in electronic format only. Electronic data, such as live recordings of cells, can be submitted via Moodle as supplementary material (or, if size restricts prohibit, uploaded to Microsoft OneDrive and a shared link provided in the report).

Abbreviations, Units and Symbols

Use only standard abbreviations; the full term for which an abbreviation stands should precede its first use in the text. SI units and symbols should be used for all quantities unless convention dictates otherwise. For example, blood pressure is commonly measured in the hospital or clinic using mmHg, not the SI unit of Pascals. For gene names and loci, proteins, virus nomenclature should follow convention in each field. Students should refer to the supervisor to assistance.

Formatting and Technical Instructions

Text should be times roman, 12-point font, with 1.5 line spacing throughout the manuscript. Margins should be 3 cm on the left-hand side, 2 cm on the right-hand, 2 cm at the top and 2 cm at the bottom. The manuscript should be 5000 words (+/- 10%) excluding the abstract, acknowledgements and references, tables, figures, legends, in-text citations, supplementary data.

Provision for papers submitted to a journal prior to thesis due date

If a student has submitted their report as a paper to a journal before submission, which has different requirements to that in this document (such as word limit, font and spacing etc), then the student must also submit a statement to that effect in the submission. This statement must include the journal requirements (including word and figure limits) for the assessors. The statement should be signed by the supervisor, and include a statement of contribution (as not all journals require this section).

Attendance Requirements

There is no official class time for this course. Your face-to-face time needs to be organised with your supervisor, as you are expected to meet them at least once per week. You must still ensure your **enrolment and registration** is up to date.

Course Schedule

View class timetable

Timetable

Date	Type	Content
Study Week: 21 November - 24 November	Assessment	Report Due Tuesday Week 11 11:59 pm

Resources

Prescribed Resources

Resources will be made available to help students guide them in their journey for Thesis A.

Extensions

You can apply for special consideration when illness or other circumstances interfere with your assessment performance.

Other applications for extension of submission of thesis reports (e.g. equipment breakdown, etc.):

1. Discuss the possibility of an extension with your supervisor first.
2. Requests can then be lodged by the student here http://tinyurl.com/yy2jzpyv. The supervisor will then receive an email asking them to approve, before it is escalated to the decision panel.
3. Request must be lodged by **Week 6** of term.
4. Panel decision will be made by end of **week 7**.
5. The decision will be made by a panel – consisting of the HoS (or their nominee), Thesis Coordinator, and 1 other person.
6. Students should be alerted to the fact that this is not guaranteed, and thus should not rely on getting an extension.
7. Typically, extensions are granted UP TO 3 weeks. The length of the extension needs to be requested and justified by the supervisor. Panel will decide the length of time granted.

Procedure if you fail

Students have three options.

1. re-enrol for BIOM9020/9021, new project and supervisor
2. re-enrol for BIOM9021 again with the same project - needs consent of an appropriate supervisor & student
3. Student does further work, re-submits thesis after a max of 6 weeks. *Course* mark capped at 50%. If still not satisfactory, then needs to re-enrol.

This last option is only available if the original mark was ≥40, OR if the student is in their last semester before graduation (regardless of the original mark).

Industry based projects

We encourage students to seek partnerships with industry, so students can have a co-supervisor from industry. However, if confidentiality is required, a confidential disclosure agreement (CDA) is obligatory. The agreement will protect the intellectual property rights of the industry partner, UNSW and the student. Students or academics are **not authorised** to sign confidential disclosure agreements on behalf of UNSW and are advised to talk to the course coordinator and UNSW legal office to arrange for drafting and signing of the confidential disclosure or research agreement.

Late procedure

In all cases, applications for late submission can be applied for BEFORE the due date. This is at the

discretion of the thesis coordinator but should only be granted in exceptional circumstances. As per normal, students can also apply through myUNSW for special consideration.

5 marks will be deducted off the *thesis* for every day late. Penalty applies until the marks for the *course* decrease to 50, and further lateness does not result in failure of the *course*, but might be a failure of the thesis (weekends count as days).

Additional support for students

- The Current Students Gateway: https://student.unsw.edu.au/
- Academic Skills and Support: https://student.unsw.edu.au/academic-skills
- *Student Wellbeing, Health and Safety:* https://student.unsw.edu.au/wellbeing
- Disability Support Services: https://student.unsw.edu.au/disability-services
- UNSW IT Service Centre: https://www.it.unsw.edu.au/students/index.html

Recommended Resources

The Scientific Report writing guidelines were adapted from Nature Biomedical Engineering (https://www.nature.com/natbiomedeng/info/final-submission) and the Uniform Requirements for Manuscripts Submitted to Biomedical Journals, the British Journal of Pharmacology, the Journal of Anatomy, the Journal of Pathology and the Journal of Physiology.

Other resources:

- Thesis writing for Engineering and Science students: https://student.unsw.edu.au/honours-thesis-writing-engineering-and-science-students
- How to write a hypothesis https://theiteducation.com/research-hypothesis-examples-howto-write-hypothesis/
- Shaw M. Writing good software engineering research papers. Proc - Int Conf Softw Eng. 2003. p. 726–36.

Smart thinking (https://www.student.unsw.edu.au/smarthinking**)**

Smarthinking is an online writing support platform officially sanctioned by UNSW. Students can submit drafts of their writing to a Smarthinking tutor or connect to a Smarthinking tutor in a real-time session and receive comprehensive feedback on a variety of writing areas. For all enquiries, please contact Smarthinking@unsw.edu.au.

Course Evaluation and Development

Submission of Assessment Tasks

Laboratory reports and major assignments will require a Non Plagiarism Declaration Cover Sheet.

Assignments should be submitted on time. A daily penalty of 5% of the marks available for that assignment will apply for work received after the due date. Any assignment more than 5 days late will not be accepted. The only exemption will be when prior permission for late submission has been granted by the Course coordinator. Extensions will be granted only on medical or compassionate grounds under extreme circumstances.

Academic Honesty and Plagiarism

PLAGIARISM

Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise will have their names entered on a plagiarism register and will be liable to disciplinary action, including exclusion from enrolment.

It is expected that all students must at all times submit their own work for assessment. Submitting the work or ideas of someone else without clearly acknowledging the source of borrowed material or ideas is plagiarism.

All assessments which you hand in must have a Non Plagiarism Declaration Cover Sheet. This is for both individual and group work. Attach it to your assignment before submitting it to the Course Coordinator or at the School Office.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:
https://student.unsw.edu.au/plagiarism

Academic Information

COURSE EVALUATION AND DEVELOPMENT
Student feedback has helped to shape and develop this course, including feedback obtained from on-line evaluations as part of UNSW's as part of UNSW's myExperience process. You are highly encouraged to complete such an on-line evaluation toward the end of Term. Feedback and suggestions provided will be important in improving the course for future students.

DATES TO NOTE
Refer to MyUNSW for Important Dates, available at:
https://my.unsw.edu.au/student/resources/KeyDates.html

ACADEMIC ADVICE
For information about:

- Notes on assessments and plagiarism,
- Special Considerations,
- School Student Ethics Officer, and
- BESS

refer to the School website available at
http://www.engineering.unsw.edu.au/biomedical-engineering/

Supplementary Examinations:

Supplementary Examinations for Term 1 2022 will be held on (TBC) should you be required to sit one.

This course outline sets out description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle should be consulted for the up to date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline (as updated in Moodle), the description in the Course Outline/Moodle applies.

Image Credit

https://lupinepublishers.com/biomedical-sciences-journal/

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW

Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	✓
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	✓
PE2.2 Fluent application of engineering techniques, tools and resources	✓
PE2.3 Application of systematic engineering synthesis and design processes	✓
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	✓
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	✓
PE3.2 Effective oral and written communication in professional and lay domains	✓
PE3.3 Creative, innovative and pro-active demeanour	✓
PE3.4 Professional use and management of information	✓
PE3.5 Orderly management of self, and professional conduct	✓
PE3.6 Effective team membership and team leadership	