

BIOM9621

Biological Signal Analysis

Term 3, 2021

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	activity is compulsory (2% of assessment). In the course you will also need to develop programming skills using Matlab (online or on a computer). You may be required to complete the Matlab quiz (assessment).
Lectures	Each week there will be a short lecture of approximately one hour duration, followed by a tutorial or a laboratory session (so you will have 2 hours of contact time per week).
Tutorials	The tutorial/laboratory session aims to help you understand how to apply signal theory to practical problems.
Assessments	The assignment (15%) will help you to reinforce and extend your knowledge in analog and digital signal processing. We advise that you use the assignment to discover your areas of interest and that you may study more effectively.
Laboratory Work	The practical component of this course will teach you how to use a signal generator, oscilloscope and simple RC circuit. You will also be required to analyse the frequency content of a signal. The two lab reports will be worth 16% of the assessment.
Group work	You will attempt to design a mechanical controller to support patients with Corneal failure. In week 10 you will present your design to class. You will also hand in individual reports.

Additional Course Information

Presumed knowledge and skills

It is expected that the student has completed one year of university mathematics. Integral calculus and complex numbers will play a particularly important role. Some experience in computing (any language) is desirable but not required. Matlab and Simulink will be provided.

How BIOM9621 relates to other courses

This course is offered in the various biomedical engineering masters programs: BIOM9640 Biomedical Instrumentation and BIOM9650 Biosensors and Transducers.

BIOM9621 focuses on the data acquisition process itself, the conversion of analog to digital form, and on some of the numerical methods used to analyse the data.

BIOM9640 is an introduction to the physiological measurement of bioelectric signals, neurostimulation and the instrumentation involved. BIOM9650 examines the various transducers used to measure pressure, flow, volume and other physiological parameters.

Course content

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Online Maths and Matlab Revision Quizzes	4%	29/09/2021 12:00 AM	1, 2, 3, 4, 5, 6
2. Major topic online quizzes	50%	Not Applicable	2, 5
3. Lab reports	16%	10/11/2021 12:00 AM	2, 3, 4, 5, 6
4. Group project. Development of a mechanical ventilator controller to support respiratory failure in COVID patients	15%	Not Applicable	
5. Major Assignment	15%	17/11/2021 12:00 AM	2, 4, 5

Assessment 1: Online Maths and Matlab Revision Quizzes

Due date 29/09/2021 12:00 AM

These quizzes will assess Maths and Matlab prerequisites wET8s wfu0gg011.03





Criteria	Mark
x number of patients that survive for your simulation) / (MM) highest number of patients saved for all simulations, m lowest number of patients saved all simulations	

e) reflection on how well the team worked together including your role

Criteria	Mark
Does not provide roles and responsibilities of group members, and what was achieved as a group. No contribution to group work	0
Provides roles and responsibilities of group members and provides what each member contributed to the group output. Minor contribution to group work	5
Comments on potential shortcomings of teamwork and how to form an effective medical device R&D team in the future. A significant contribution to group work	10

f) additional analysis or refinement or value-add to the group's output conducted by yourself. (2 marks)

Criteria	Mark
Does not report what was shared between group members, and acknowledge the contribution of individual members	0
Resolves additional minor issues not solved by the group e.g., enhanced literature review	5
Resolves additional major issues not solved by the group e.g., modified controller design to increase patient survival	10

Attendance Requirements

Students are strongly encouraged to attend all classes and review lec

Course Schedule

Contact hours 3 hours per week

Lecture Thursday 10:00 am 11:00 am
(online)

Tutorial/Laboratory Thursday 11:00 am 1:00 pm
(online)

Online Activities 3 hours

[View class timetable](#)

Timetable

Date	Type	Content
Week 1: 13 Sept - 17 September	Online Activity	

	Online Activity	Digital acquisition of signals and frequency domain analysis (Tutorial)
	Online Activity	Estimate Fourier series coefficients for a pulse waveform (demonstration)
Week 6: 18 October - 22 October	Online Activity	Medical Device Design (RN/RA)
	Group Work	Group formation, project selection (subject to allocation of roles and responsibilities) and identification of signal for the project (supplied).
Week 7: 25 October - 29 October	Online Activity	z-transform and introduction to digital filters Using Matlab to design digital filters
	Online Activity	Evaluating z-functions on the unit circle and zero-padding. Explore the effects of Ad-hoc filter design and difference equation implementation. FIR and IIR filter design (Tutorial)
Week 8: 1 November - 5 November	Online Activity	PID control (RA). Using Matlab/Simulink to design and tune control system
	Online Activity	Ziegler-Nichols tuning of PID control
	Online Activity	Matlab exercises (Practical)
Week 9: 8 November - 12 November	Online Activity	Sampling and spectral analysis of biological signals (RA)
	Online Activity	Periodogram and short time Fourier transform (tutorial)
	Online Activity	Digital sampling online quiz 10-11 am
Week 10: 15 November - 19 November	Group Activity	Medical Device Design and Analysis (presentations) Groups present their medical device concept and simulate its performance
	Online Activity	z-transform and introduction and digital sampling online quiz 10-11 am (10%)

Resources

Prescribed Resources

All material will be provided via Moodle. Teams tutorials will be recorded.

Recommended Resources

DATES TO NOTE

Refer to MyUNSW for [Important Dates](#)

PLAGIARISM

Beware! An assignment that includes plagiarised material will receive a low mark. Plagiarism may fail the course. Students who plagiarise will have their names entered in the plagiarism register and will be liable to disciplinary action, including exclusion from the course.

It is expected that all students must at all times submit their own work. Copying or using work or ideas of someone else without clearly acknowledging the source is plagiarism.

All assessments which you submit have to include a [Non-Plagiarism Declaration](#). This is short and simple to complete. 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. It is undesirable to use other people's material. If you do use other people's material you should adequately acknowledge it and where you found them (giving the complete reference details). The Learning Centre provides further information on what constitutes plagiarism.

<https://student.unsw.edu.au/plagiarism>

ACADEMIC ADVICE

Last year we had problems with contract cheating and sharing of answers. There were serious breaches of academic conduct. Please read and follow the [academic misconduct procedure](#). It is expected that students attend all lectures and tutorials.

Assignments submitted after the due date without prior notification will result in a deduction in marks.

UNSW has a wide range of student support services. The resources listed below are for students needing assistance related to aspects of their overall University experience. Regarding this course, assistance can be sought from the course coordinator.

<http://www.student.unsw.edu.au/>

https://my.unsw.edu.au/student/howdoi/HowDoI_MainPage.html

<http://www.counselling.unsw.edu.au/>

Those students who have a disability that requires some adjustment in environment are encouraged to discuss their study needs with the counsellor at the commencement of, their [Disability Support Services](#) to be discussed may include access to materials, signers or note-takers, the provision of special assessment arrangements. Early notification is essential to enable arrangements to be made.

If you believe that your performance in an assessable component of the course is affected by illness or another unexpected circumstance, you should make an application as soon as possible after the event by visiting UNSW Student Central. Please contact the course coordinator as well and note that considerations are not granted automatically.

UNSW has strict policies and expectations relating to Occupational Health and Safety at <http://www.ohs.unsw.edu.au/>

Course Evaluation and Development

Student feedback has helped to shape and develop this course, including online evaluations as part of UNSW's Course and Teaching [My Experience](#) and the course evaluation process. To discourage cheating and encourage independent problem-solving, the percentage of assessment contributed by the final exam.

Laboratory Workshop Information

Face-to-face labs will be replaced by online demonstrations. I will generally need to analyse for your individual reports.

Submission of Assessment Tasks

Laboratory reports and major assignments [Non-Plagiarism Declaration Cover Sheet](#)

Late submissions will be penalised 10% of the mark for each calendar day in meeting the nominated submission date please contact the Course Coordinator to discuss your situation as soon as possible.

Academic Honesty and Plagiarism

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Academic Information

COURSE EVALUATION AND DEVELOPMENT

Student feedback has helped to shape and develop this course, including on-line evaluations as part of UNSW's myExperience platform. We encourage you to complete such an on-line evaluation toward the end of the semester. Your feedback 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 3 2021 will be held on Monday 18 January (inclusive) should you be required to sit one.

Image Credit

Engraved portrait of French mathematician Jean Baptiste Joseph Fourier, 18th century.

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineering Standard

Program Intended Learning Outcomes	
Knowledge and skill base	P
PE1.1 Comprehensive, theory based understanding of the physical sciences and the engineering fundamentals applicable to the	underpinnin applicable to the
PE1.2 Conceptual understanding of the mathematics, numerical analysis computer and information sciences which underpin the engineering dis	numerical analys engineering dis
PE1.3 In-depth understanding of specialist bodies of knowledge within discipline	knowledge within