ELEC9721

Digital Signal Processing Theory and Applications

Term 2, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Andrew Dempster	a.dempster@unsw.edu.au	email	409, EET	56890

School Contact Information

Consultations: Lecturer consultation times will be advised during the first lecture. You are welcome to email the tutor or laboratory demonstrator, who can answer your questions on this course and can also provide you with consultation times. ALL email enquiries should be made from your student email address with ELEC/TELExxxx in the subject line; otherwise they will not be answered.

Keeping Informed: Announcements may be made during classes, via email (to your student email address) and/or via online learning and teaching platforms – in this course, we will use Moodle https://moodle.telt.unsw.edu.au/login/index.php. Please note that you will be deemed to have received this information, so you should take careful note of all announcements.

Student Support Enquiries

For enrolment and progression enquiries please contact Student Services

Web

Electrical Engineering Homepage

Engineering Student Support Services

Engineering Industrial Training

UNSW Study Abroad and Exchange (for inbound students)

UNSW Future Students

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

Email

Engineering Student Support Services – current student enquiries

- e.g. enrolment, progression, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries

- e.g. admissions, fees, programs, credit transfer

Course Details

Units of Credit 6

Summary of the Course

Least squares digital filter design and realisation, finite word length effects, random processes, adaptive filters, linear prediction, multi-rate signal processing, time-frequency analysis, sub-band transforms and wavelets. Applications may include: tone detection, noise reduction, pitch estimation, etc.

Course Aims

The course aims to give students the fundamental of signal processing as well as explore some important and illustrative applications in digital circuits and digital communication. We will start by defining and understanding signals which will enable us to see the need and aims of processing them. We will then study a number of signal processing tools and the mathematical concepts they are based on. We also study some important applications in order to elucidate the concepts learned. Topics to be covered in the course are the following: digital signals; digital filter design; statistical and adaptive signal processing; Bayes estimations; Applications in digital circuits and digital communication.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Understand and explain fundamentals of Digital Signal Processing as well as knowledge of some of its important applications.	PE1.1, PE1.2, PE1.3, PE1.4, PE1.5, PE3.2, PE3.5
2. Understand and explain signals and transforms, filters, random variables and elementary statistical signal processing, and time frequency analysis among other topics	PE1.1, PE1.2, PE1.3, PE1.4
3. Implement key digital signal processing methods and algorithms	PE1.5, PE2.1, PE2.2, PE2.3, PE3.2, PE3.3, PE3.5

Teaching Strategies

The course consists of the following elements: lectures (first 2 hours of the lectures), tutorials (last hour of the lectures), and assignments. At the beginning of each lecture and tutorials, the copies of their contents will be distributed to students. All of them will be posted on the website at the end of the session.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Mid-session exam	15%	11/07/2022 02:00 PM	1, 2
2. Final examination	40%	Not Applicable	1, 2, 3
3. Assignments 1 & 2	35%	Not Applicable	1, 2, 3
4. Labs	10%	Not Applicable	1, 2, 3

Assessment 1: Mid-session exam

Due date: 11/07/2022 02:00 PM

Exam tests your general understanding of the course material and questions may be drawn from any course material up to the end of week 5.

Assessment 2: Final examination

Start date: 15/08/2022 02:00 PM

Exam run using timed questions in Moodle.

Assessment 3: Assignments 1 & 2

Start date: 29/07/2022 12:00 AM

There are two types of assignments in the course: a major assignment to work on over several weeks, and short sets of problems arising from the lectures. The major assignment will be a Matlab program that solves a particular signal processing problem.

Assessment 4: Labs (Group)

Submission notes: weekly

Each week student use Matlab to practice the techniques covered in the lecture.

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Schedule

View class timetable

Timetable

Date	Type	Content
O-Week: 23 May - 27 May		
Week 1: 30 May - 3 June	Lecture	Course Intro, recorded lecture, problems due
Week 2: 6 June - 10 June	Laboratory	Laboratory, recorded lecture
Week 3: 13 June - 17 June	Laboratory	Laboratory, recorded lecture, problems due
Week 4: 20 June - 24 June	Laboratory	Laboratory, recorded lecture, assignment available
Week 5: 27 June - 1 July	Laboratory	Laboratory, recorded lecture, problems due
Week 6: 4 July - 8 July	Laboratory	Laboratory, recorded lecture,
Week 7: 11 July - 15 July	Laboratory	Mid-term exam, recorded lecture
	Assessment	Mid-session exam
Week 8: 18 July - 22 July		Laboratory, recorded lecture
Week 9: 25 July - 29 July	Laboratory	Laboratory, recorded lecture, assignment due
Week 10: 1 August - 5 August	Laboratory	Laboratory, recorded lecture, problems due

Resources

Prescribed Resources

Recorded lectures

Academic Honesty and Plagiarism

Academic Honesty and Plagiarism

Plagiarism is the unacknowledged use of other people's work, including the copying of assignment works and laboratory results from other students. Plagiarism is considered a form of academic misconduct, and the University has very strict rules that include some severe penalties. For UNSW policies, penalties and information to help you avoid plagiarism, see https://student.unsw.edu.au/plagiarism. To find out if you understand plagiarism correctly, try this short quiz: https://student.unsw.edu.au/plagiarism-quiz.

General Conduct and Behaviour

Consideration and respect for the needs of your fellow students and teaching staff is an expectation. Conduct which unduly disrupts or interferes with a class is not acceptable and students may be asked to leave the class.

Academic Information

COVID19 - Important Health Related Notice

Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by NSW health or government authorities. Current alerts and a list of hotspots can be found here. **You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate**. We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed.

If you are required to self-isolate and/or need emotional or financial support, please contact the Nucleus: Student Hub. If you are unable to complete an assessment, or attend a class with an attendance or participation requirement, please let your teacher know and apply for special consideration through the Special Consideration portal. To advise the University of a positive COVID-19 test result or if you suspect you have COVID-19 and are being tested, please fill in this form.

UNSW requires all staff and students to follow NSW Health advice. Any failure to act in accordance with that advice may amount to a breach of the Student Code of Conduct. Please refer to the Safe Return to Campus guide for students for more information on safe practices.

Dates to note

Important Dates available at: https://student.unsw.edu.au/dates

Student Responsibilities and Conduct

Students are expected to be familiar with and adhere to all UNSW policies (see https://student.unsw.edu.au/policy), and particular attention is drawn to the following:

Workload

It is expected that you will spend at least **15 hours per week** studying a 6 UoC course, from Week 1 until the final assessment, including both formal classes and *independent, self-directed study*. In periods where you need to complete assignments or prepare for examinations, the workload may be greater. Over-commitment has been a common source of failure for many students. You should take the required workload into account when planning how to balance study with employment and other activities.

Attendance

Regular and punctual attendance at all classes is expected. UNSW regulations state that if students attend less than 80% of scheduled classes they may be refused final assessment.

Work Health and Safety

UNSW policy requires each person to work safely and responsibly, in order to avoid personal injury and to protect the safety of others.

Special Consideration and Supplementary Examinations

You must submit all assignments and attend all examinations scheduled for your course. You can apply for special consideration when illness or other circumstances beyond your control interfere with an assessment performance. If you need to submit an application for special consideration for an exam or assessment, you must submit the application **prior to the start** of the exam or before the assessment is submitted, except where illness or misadventure prevent you from doing so. Be aware of the "fit to sit/submit" rule which means that if you sit an exam or submit an assignment, you are declaring yourself well enough to do so and cannot later apply for Special Consideration. For more information and how to apply, see https://student.unsw.edu.au/special-consideration.

Administrative Matters

On issues and procedures regarding such matters as special needs, equity and diversity, occupational health and safety, enrolment, rights, and general expectations of students, please refer to the School and UNSW policies:

https://student.unsw.edu.au/guide

https://www.engineering.unsw.edu.au/electrical-engineering/resources

Disclaimer

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

Synergies in Sound 2016

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	