ELEC880

Cognitive Radio

S1 Day 2018

Dept of Engineering

Contents

General Information

Unit convenor and teaching staff
Convener and Lecturer
Sam Reisenfeld
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Contact via 02 9 850 6002
E6B, Room 113
Thursday, 3-5 pm

Tutor
Shahidul Islam
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Credit points
4

Prerequisites
Admission to MEng

Corequisites

Co-badged status

Unit description
Cognitive radio is a broad term that applies to many modern technologies that allow wireless and telecommunications systems to provide flexibility in the field after deployment as well as high performance in basic design and analysis where traditional techniques may be found lacking. This unit will systematically identify the key elements and concepts underlying the field and work to develop specific examples applicable to today's solutions.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

Familiarity with spectrum sharing concepts in relation to Cognitive Radio Networks.
Working knowledge of probability, random variables, and random processes.
Working knowledge of the application of Matlab for analysis, simulation, and visualization.

Working knowledge of digital modulation and signal detection.

Working knowledge of link budgets and of considerations of noise and interference in Cognitive Radio Network Design.

Understanding of the role of Spectrum Sensing in Cognitive Radio Networks.

Understanding of the role of Agile Transmission Techniques in Cognitive Radio Networks.

General Assessment Information

A mark of 50 or more is required to obtain a passing grade.

A mark of 65 to 74 is required to obtain a credit (CR).

A mark of 75 to 84 is required to obtain a distinction (D).

A mark of 85 or above is required to obtain a high distinction (HD).

Assessment Tasks

Name	Weighting	Hurdle	Due
Class Exam 1	5%	No	28/3/2018
Class Exam 2	5%	No	9/5/2018
Class Exam 3	5%	No	30/5/2018
Report on spectrum sensing	35%	No	1/6/2018
Final Examination	50%	No	Final Exam Period

Class Exam 1

Due: **28/3/2018**
Weighting: **5%**

Class examination on Probability, Random Variables, and Random Processes

On successful completion you will be able to:

- Familiarity with spectrum sharing concepts in relation to Cognitive Radio Networks.
- Working knowledge of probability, random variables, and random processes.
- Working knowledge of the application of Matlab for analysis, simulation, and visualization.
- Working knowledge of digital modulation and signal detection.

Class Exam 2

Due: **9/5/2018**
Weighting: **5%**

Class examination on signal detection and link budgets.

On successful completion you will be able to:

- Familiarity with spectrum sharing concepts in relation to Cognitive Radio Networks.
- Working knowledge of probability, random variables, and random processes.
- Working knowledge of the application of Matlab for analysis, simulation, and visualization.
- Working knowledge of digital modulation and signal detection.
- Working knowledge of link budgets and of considerations of noise and interference in Cognitive Radio Network Design.

Class Exam 3

Due: **30/5/2018**
Weighting: **5%**

Class examination on spectrum sensing.

On successful completion you will be able to:

- Familiarity with spectrum sharing concepts in relation to Cognitive Radio Networks.
- Working knowledge of probability, random variables, and random processes.
- Working knowledge of the application of Matlab for analysis, simulation, and visualization.
- Working knowledge of digital modulation and signal detection.
- Working knowledge of link budgets and of considerations of noise and interference in Cognitive Radio Network Design.
- Understanding of the role of Spectrum Sensing in Cognitive Radio Networks.
- Understanding of the role of Agile Transmission Techniques in Cognitive Radio Networks.

Report on spectrum sensing

Due: **1/6/2018**
Weighting: **35%**

Report on spectrum sensing techniques and cognitive radio. The report must be less than 5,000 words . The page counts for references and appendices are unlimited. All Matlab

computer code and results must be included in the report. The report needs to be submitted on iLearn.

There will be weekly hands-on" practical work involving mathematical analysis and computation using Matlab. Laboratory reports on this work must be included as a chapter of the Report.

Reports showing a high degree of plagiarism will be giving a mark of 0. The report needs to be done independently and cannot reflect a high degree of correlation with the work of other students or any previously published literature. Matlab code must be written independently by each student. Work taken from the literature needs to be properly referenced. If work is taken "word for word" without modification from the literature, the phases taken identically will need to be enclosed in parenthesis marks and the exact references, including page numbers, need to be given.

On successful completion you will be able to:

- Familiarity with spectrum sharing concepts in relation to Cognitive Radio Networks.
- Working knowledge of probability, random variables, and random processes.
- Working knowledge of the application of Matlab for analysis, simulation, and visualization.
- Working knowledge of digital modulation and signal detection.
- Working knowledge of link budgets and of considerations of noise and interference in Cognitive Radio Network Design.
- Understanding of the role of Spectrum Sensing in Cognitive Radio Networks.
- Understanding of the role of Agile Transmission Techniques in Cognitive Radio Networks.

Final Examination

Due: **Final Exam Period**
Weighting: **50%**

Closed book final examination covering the entire unit.

On successful completion you will be able to:

- Familiarity with spectrum sharing concepts in relation to Cognitive Radio Networks.
- Working knowledge of probability, random variables, and random processes.
- Working knowledge of the application of Matlab for analysis, simulation, and visualization.
- Working knowledge of digital modulation and signal detection.
- Working knowledge of link budgets and of considerations of noise and interference in

Cognitive Radio Network Design.

- Understanding of the role of Spectrum Sensing in Cognitive Radio Networks.
- Understanding of the role of Agile Transmission Techniques in Cognitive Radio Networks.

Delivery and Resources

There are no hurdle tasks.

There will be no supplementary examinations for the in-class examinations.

Practicals involving Matlab are done on laboratory computers during Practical Classes.

The tutor will be available to assist students.

The tutor will also solve tutorial questions during Practical.

Students may download Matlab and do laboratory work on their own computers.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/study/getting-started/student-conduct

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcomes

- Familiarity with spectrum sharing concepts in relation to Cognitive Radio Networks.
- Working knowledge of link budgets and of considerations of noise and interference in Cognitive Radio Network Design.
- Understanding of the role of Spectrum Sensing in Cognitive Radio Networks.
- Understanding of the role of Agile Transmission Techniques in Cognitive Radio Networks.

Assessment tasks

- Class Exam 3
- Report on spectrum sensing
- Final Examination

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- Familiarity with spectrum sharing concepts in relation to Cognitive Radio Networks.
- Working knowledge of probability, random variables, and random processes.
- Working knowledge of the application of Matlab for analysis, simulation, and visualization.
- Working knowledge of digital modulation and signal detection.
- Working knowledge of link budgets and of considerations of noise and interference in Cognitive Radio Network Design.
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Assessment tasks

- Class Exam 1
- Class Exam 2
- Class Exam 3
- Report on spectrum sensing
- Final Examination

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- Familiarity with spectrum sharing concepts in relation to Cognitive Radio Networks.
- Working knowledge of probability, random variables, and random processes.
- Working knowledge of the application of Matlab for analysis, simulation, and visualization.
- Working knowledge of digital modulation and signal detection.
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PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcomes

- Familiarity with spectrum sharing concepts in relation to Cognitive Radio Networks.
- Working knowledge of probability, random variables, and random processes.
- Working knowledge of the application of Matlab for analysis, simulation, and

visualization.
- Working knowledge of digital modulation and signal detection.
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- Class Exam 3
- Report on spectrum sensing
- Final Examination

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcomes

- Familiarity with spectrum sharing concepts in relation to Cognitive Radio Networks.
- Working knowledge of probability, random variables, and random processes.
- Working knowledge of the application of Matlab for analysis, simulation, and visualization.
- Working knowledge of digital modulation and signal detection.
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Assessment tasks

- Class Exam 1
- Class Exam 2
- Class Exam 3

- Report on spectrum sensing
- Final Examination

PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues

This graduate capability is supported by:

Learning outcomes

- Familiarity with spectrum sharing concepts in relation to Cognitive Radio Networks.
- Understanding of the role of Spectrum Sensing in Cognitive Radio Networks.
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Assessment tasks

- Class Exam 3
- Report on spectrum sensing
- Final Examination