ELEC8844
Signal Processing for Software Defined Radio
Session 1, Special circumstances 2021
School of Engineering

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Notice
As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to timetable viewer. To check detailed information on unit assessments visit your unit’s iLearn space or consult your unit convenor.
General Information

Unit convenor and teaching staff
Convenor
Sam Reisenfeld
sam.reisenfeld@mq.edu.au
Contact via E-mail
44 Waterloo Road, Room 135
Friday, 3-5 pm, by appointment

Lecturer
Yiqing Lu
yiqing.lu@mq.edu.au
Contact via E-mail
7E Wally's Walk, Room G08
By appointment

Tutor
Shahidul Islam
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44 Waterloo Road, Room G53
Friday 3-5 pm, by appointment

Credit points
10

Prerequisites
Admission to MEngElecEng

Corequisites
20cp at 8000 level

Co-badged status
Unit description
This unit aims to provide students with the theory and hands-on experience in designing and implementing digital signal processing algorithms using software defined radio technology. The unit builds on from preceding Digital Signal Processing unit and introduces the software defined radio concept along with various software defined radio architectures and platforms. Topics covered include: sampling and quantisation, low-pass representation of bandpass systems, quadrature-signal representation, frequency translation, sample rate conversion, decimation and interpolation, direct and polyphase interpolator and decimator architectures, half-band FIR filters, digital up and down converters, matched filters and the software defined radio architectures and platforms. The unit culminates in a project where students develop a software defined radio technology-based solution from high-level functional specifications through to design, implementation and testing on real hardware.

Important Academic Dates
Information about important academic dates including deadlines for withdrawing from units are available at https://students.mq.edu.au/important-dates

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

ULO1: Describe what a software defined radio platform is and its constituent functional components.

ULO2: Comprehensively convey the advantages and limitations of various software-defined-radio-specific digital signal processing algorithms and their efficient implementations.

ULO3: Undertake quantitative performance analysis and contrast various digital signal processing algorithms and their implementations on software defined radio platforms.

ULO4: Design, implement and test digital signal processing algorithms on real software defined radio hardware platforms.

ULO5: Prepare design documents and reports and communicate and explain design decisions.

General Assessment Information
To pass this unit, students must achieve an average grade of 50%.

Late submissions will attract a penalty of 10% of marks per day. Extenuating circumstances will be considered upon lodgment of an application for special consideration. Resubmissions of work are not allowed.
Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
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</thead>
<tbody>
<tr>
<td>Assignment 1</td>
<td>10%</td>
<td>No</td>
<td>Week 4</td>
</tr>
<tr>
<td>Defence 1</td>
<td>15%</td>
<td>No</td>
<td>Week 5</td>
</tr>
<tr>
<td>Assignment 2</td>
<td>10%</td>
<td>No</td>
<td>Week 10</td>
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<tr>
<td>Defence 2</td>
<td>20%</td>
<td>No</td>
<td>Week 11</td>
</tr>
<tr>
<td>Project Report</td>
<td>15%</td>
<td>No</td>
<td>Week 12</td>
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<tr>
<td>Project Defence and Demonstration</td>
<td>30%</td>
<td>No</td>
<td>Week 13</td>
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</tbody>
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Assignment 1
Assessment Type ¹: Report
Indicative Time on Task ²: 20 hours
Due: Week 4
Weighting: 10%

Assignment 1 Report (1000 word equivalent)

On successful completion you will be able to:

- Describe what a software defined radio platform is and its constituent functional components.
- Comprehensively convey the advantages and limitations of various software-defined-radio-specific digital signal processing algorithms and their efficient implementations.
- Undertake quantitative performance analysis and contrast various digital signal processing algorithms and their implementations on software defined radio platforms.
- Design, implement and test digital signal processing algorithms on real software defined radio hardware platforms.
- Prepare design documents and reports and communicate and explain design decisions.

Defence 1
Assessment Type ¹: Viva/oral examination
Indicative Time on Task ²: 5 hours
Due: Week 5
Weighting: 15%

An oral examination on the first part of the unit
On successful completion you will be able to:

- Describe what a software defined radio platform is and its constituent functional components.
- Comprehensively convey the advantages and limitations of various software-defined-radio-specific digital signal processing algorithms and their efficient implementations.
- Undertake quantitative performance analysis and contrast various digital signal processing algorithms and their implementations on software defined radio platforms.
- Design, implement and test digital signal processing algorithms on real software defined radio hardware platforms.
- Prepare design documents and reports and communicate and explain design decisions.

**Assignment 2**

**Assessment Type 1:** Report  
**Indicative Time on Task 2:** 20 hours  
**Due:** **Week 10**  
**Weighting:** **10%**

Assignment 2 Report (1000 word equivalent)

On successful completion you will be able to:

- Describe what a software defined radio platform is and its constituent functional components.
- Comprehensively convey the advantages and limitations of various software-defined-radio-specific digital signal processing algorithms and their efficient implementations.
- Undertake quantitative performance analysis and contrast various digital signal processing algorithms and their implementations on software defined radio platforms.
- Design, implement and test digital signal processing algorithms on real software defined radio hardware platforms.
- Prepare design documents and reports and communicate and explain design decisions.

**Defence 2**

**Assessment Type 1:** Viva/oral examination  
**Indicative Time on Task 2:** 5 hours  
**Due:** **Week 11**  
**Weighting:** **20%**

An oral examination on the second part of the unit.

On successful completion you will be able to:
• Describe what a software defined radio platform is and its constituent functional components.
• Comprehensively convey the advantages and limitations of various software-defined-radio-specific digital signal processing algorithms and their efficient implementations.
• Undertake quantitative performance analysis and contrast various digital signal processing algorithms and their implementations on software defined radio platforms.
• Design, implement and test digital signal processing algorithms on real software defined radio hardware platforms.
• Prepare design documents and reports and communicate and explain design decisions.

Project Report
Assessment Type 1: Report
Indicative Time on Task 2: 25 hours
Due: Week 12
Weighting: 15%

Project Report (2000-word equivalent)

On successful completion you will be able to:
• Describe what a software defined radio platform is and its constituent functional components.
• Comprehensively convey the advantages and limitations of various software-defined-radio-specific digital signal processing algorithms and their efficient implementations.
• Undertake quantitative performance analysis and contrast various digital signal processing algorithms and their implementations on software defined radio platforms.
• Design, implement and test digital signal processing algorithms on real software defined radio hardware platforms.
• Prepare design documents and reports and communicate and explain design decisions.

Project Defence and Demonstration
Assessment Type 1: Viva/oral examination
Indicative Time on Task 2: 10 hours
Due: Week 13
Weighting: 30%

An oral examination of the outcomes of the project

On successful completion you will be able to:
• Describe what a software defined radio platform is and its constituent functional
components.

• Comprehensively convey the advantages and limitations of various software-defined-radio-specific digital signal processing algorithms and their efficient implementations.

• Undertake quantitative performance analysis and contrast various digital signal processing algorithms and their implementations on software defined radio platforms.

• Design, implement and test digital signal processing algorithms on real software defined radio hardware platforms.

• Prepare design documents and reports and communicate and explain design decisions.

1 If you need help with your assignment, please contact:

• the academic teaching staff in your unit for guidance in understanding or completing this type of assessment

• the Learning Skills Unit for academic skills support.

2 Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

A two-hour online lecture every week.

A one-hour SGTA online every week.

A three-hour Practical online every week.

Each student is required to purchase a NooElec RTL USB device for laboratory work in the Practicals.

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
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/admin/other-resources/student-conduct

**Results**

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) 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 or if you are a Global MBA student contact globalmba.support@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 help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

**Student Enquiry Service**

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

If you are a Global MBA student contact globalmba.support@mq.edu.au
Equity 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.

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.