



# ELEC8844

## Signal Processing for Software Defined Radio

Session 1, Weekday attendance, North Ryde 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

Sam Reisenfeld

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Office Hours: Friday, 3-5 pm, by appointment

Lecturer

Yiqing Lu

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7E Wally's Walk, Room G08

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Tutor

Shahidul Islam

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44 Waterloo Road, Room G53

Office Hours: 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://www.mq.edu.au/study/calendar-of-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 the total marks per day. Extenuating circumstances will be considered upon lodgment of an application for special consideration.

Resubmissions of work are not allowed.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Assignment 1</a>	10%	No	Week 4
<a href="#">Defence 1</a>	15%	No	Week 5
<a href="#">Assignment 2</a>	10%	No	Week 10
<a href="#">Defence 2</a>	20%	No	Week 11
<a href="#">Project Report</a>	15%	No	Week 12
<a href="#">Project Defence and Demonstration</a>	30%	No	Week 13

### Assignment 1

Assessment Type <sup>1</sup>: Report

Indicative Time on Task <sup>2</sup>: 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 <sup>1</sup>: Viva/oral examination

Indicative Time on Task <sup>2</sup>: 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 <sup>1</sup>: Report

Indicative Time on Task <sup>2</sup>: 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 <sup>1</sup>: Viva/oral examination

Indicative Time on Task <sup>2</sup>: 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 <sup>1</sup>: Report

Indicative Time on Task <sup>2</sup>: 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 <sup>1</sup>: Viva/oral examination

Indicative Time on Task <sup>2</sup>: 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.
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<sup>1</sup> 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 [Writing Centre](#) for academic skills support.

<sup>2</sup> 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

Lectures will be delivered online. The lecture duration is 2 hours.

There will be one SGTA session on-campus per week and one SGTA session online per week.

The students need to attend either an on-campus SGTA session or an online SGTA session per week.

There will be one Practical class on-campus per week and one Practical class online per week.

The students will need to attend either an on-campus Practical class or an online Practical class per week.

The student will need to purchase a NooElec RTL device to be used with their computer for Practical Classes.

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). 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](#)

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

To find other policies relating to Teaching and Learning, visit [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au) and use the [search tool](#).

## 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](https://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto: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](https://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 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](http://ask.mq.edu.au)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@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/](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.