



MEDS20009 Science and Instrumentation of Ultrasound

Term 2 - 2018

Profile information current as at 16/05/2024 08:40 am

All details in this unit profile for MEDS20009 have been officially approved by CQUniversity and represent a learning partnership between the University and you (our student). The information will not be changed unless absolutely necessary and any change will be clearly indicated by an approved correction included in the profile.

General Information

Overview

This unit aims to develop knowledge and understanding of the science and instrumentation of clinical ultrasound to enable you to produce optimum images. The unit emphasis will be on safety and quality assurance. You are required to attend ultrasound skills workshops to complete this unit. In the practical workshops you will apply your knowledge of scanning technique and image optimisation. This unit will form the foundation from which you will build image acquisition, recognition and assessment skills as part of the Graduate Certificate in Clinical Ultrasound.

Details

Career Level: *Postgraduate*

Unit Level: *Level 8*

Credit Points: 6

Student Contribution Band: 8

Fraction of Full-Time Student Load: 0.125

Pre-requisites or Co-requisites

There are no requisites for this unit.

Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the [Assessment Policy and Procedure \(Higher Education Coursework\)](#).

Offerings For Term 2 - 2018

- Mixed Mode

Attendance Requirements

All on-campus students are expected to attend scheduled classes - in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Residential Schools

This unit has a Compulsory Residential School for distance mode students and the details are:
Click here to see your [Residential School Timetable](#).

Website

[This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.](#)

Class and Assessment Overview

Recommended Student Time Commitment

Each 6-credit Postgraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

Class Timetable

[Regional Campuses](#)

Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

[Metropolitan Campuses](#)

Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Online Test**

Weighting: Pass/Fail

2. **Practical Assessment**

Weighting: Pass/Fail

Assessment Grading

This is a pass/fail (non-graded) unit. To pass the unit, you must pass all of the individual assessment tasks shown in the table above.

CQUniversity Policies

All University policies are available on the [CQUniversity Policy site](#).

You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the [CQUniversity Policy site](#).

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from "Have your say" course evaluation.

Feedback

Students found that the ultrasound concepts could be tailored specifically in the residential school and made relevant to their field of work.

Recommendation

Time allocated for performing hands on acquisition of ultrasound images can continue to be incorporated into the Residential School. The lab activities can be adapted to body regions relevant to the students' learning needs.

Feedback from "Have your say" course evaluation.

Feedback

Complex subjects were made easy to comprehend by explanations throughout the lectures. The information was delivered in manageable segments.

Recommendation

Continue to provide lectures with pictorial examples of complex theoretical concepts.

Feedback from "Have your say" course evaluation.

Feedback

Students had a positive learning experience and were promptly assisted in their concerns and given opportunity to ask specific questions via online Zoom tutorial sessions.

Recommendation

Continue the practice of providing feedback and mentoring via email and Zoom tutorials.

Feedback from Student Feedback.

Feedback

Students would appreciate an opportunity earlier in the term to practice the manipulation of ultrasound transducers and buttons to help them engage with the theory of later modules. Without attending the ultrasound laboratory earlier in the term, there is a great deal of content to cover in the final residential school and less opportunity therefore for hands on practice.

Recommendation

An optional laboratory session will be provided early in the term to assist students with the basics of ultrasound machine operation and to assist with conceptualizing the theory covered in the modules.

Feedback from "Have your say" course evaluation.

Feedback

Students would appreciate more handouts and notes to accompany the video lectures.

Recommendation

Additional notes and lecture handouts will be available in the next offering.

Unit Learning Outcomes

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

1. Apply knowledge of ultrasound interaction with tissue and practical skills to acquire diagnostic ultrasound images
2. Assess and solve problems with images in relation to artifacts and diagnostic usefulness
3. Compare the different modes of ultrasound and their applications in medical ultrasound
4. Identify and manage safety issues in medical ultrasound.

The International Federation for Emergency Medicine (IFEM) Point of care curriculum guidelines

3.3 Demonstration of how to generate and optimise an image- 1, 3 and 5

3.4 Demonstration of good practice in point-of-care ultrasound- 1.2.3.5 and 6









Alignment of Learning Outcomes, Assessment and Graduate Attributes

 N/A Level	 Introductory Level	 Intermediate Level	 Graduate Level	 Professional Level	 Advanced Level
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Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes			
	1	2	3	4
1 - Online Test - 0%	•	•		•
2 - Practical Assessment - 0%	•	•	•	•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes			
	1	2	3	4
1 - Knowledge				
2 - Communication				
3 - Cognitive, technical and creative skills				
4 - Research				
5 - Self-management				
6 - Ethical and Professional Responsibility				
7 - Leadership				
8 - Aboriginal and Torres Strait Islander Cultures				

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes							
	1	2	3	4	5	6	7	8
1 - Online Test - 0%								
2 - Practical Assessment - 0%								

Textbooks and Resources

Textbooks

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Prescribed

Artifacts in Diagnostic Medical Ultrasound, Volume 1, Greyscale Artifacts

Edition: 1st (2012)

Authors: Martin Necas

High Frequency Publishing

Sydney , NSW , Australia

ISBN: 978-0987292179

Binding: eBook

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Supplementary

The physics and technology of diagnostic ultrasound: A practitioner's guide.

Edition: 1st (2012)

Authors: Dr Robert Gill

High frequency Publishing

Abbotsford, Sydney, , NSW , Australia

ISBN: 9780987292100

Binding: Website Link

Additional Textbook Information

The most helpful resource is the prescribed book called 'Artifacts in Diagnostic Medical Ultrasound'. There is an e-book version of this available for download under the blue tab at this location

<https://ultrasoundbook.net/buy-now.html>

Alternatively click on this link to go directly to the Artifacts book by Martin Necas.

<https://sonophys.com.au/store.html#!/Artifacts-in-Diagnostic-Medical-Ultrasound-Grayscale-Artifacts-e-book/p/78816753/category=14587755&forcescroll=true>

There is an online version also of the supplementary paperback textbook by Dr Robert Gill.

<https://ultrasoundbook.net/buy-now.html> This is just a recommended reading to accompany lectures.

Gill, R. (2012). *The physics and technology of diagnostic ultrasound : A practitioner's guide*. Abbotsford, N.S.W.: High Frequency Publishing.

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Zoom Conferencing (Webcam and Microphone)

Referencing Style

All submissions for this unit must use the referencing style: [Vancouver](#)
For further information, see the Assessment Tasks.

Teaching Contacts

Bridie Wylie Unit Coordinator
b.wylie@cqu.edu.au

Schedule

Week 1 - 09 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
Module 1 Introduction to Ultrasound modes and instrumentation, transducers, image orientation, and sound wave science.	CRO copy of Chapter 2 The Physics and Technology of Diagnostic Ultrasound (R. Gill) will be available for you on Moodle. Recorded lectures available.	

Week 2 - 16 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
Module 1 Introduction to Ultrasound modes and instrumentation, transducers, image orientation, and sound wave science.	Lectures available.	Lab induction information is provided on Moodle this week. An on-site tutorial within the ultrasound lab on Saturday will be offered (Brisbane, Mackay, Melbourne and Sydney pending student numbers). It will introduce basic ultrasound concepts and probe handling skills. It will not be mandatory to attend. This will run on Saturday July 21st for 3 hours. See Moodle for more details.

Week 3 - 23 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
Module 1 Introduction to Ultrasound modes and instrumentation, transducers, image orientation, and sound wave science.	Lectures available.	

Week 4 - 30 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
Module 2 Types of resolution and beam geometry.	Written content will be supplied for this topic.	Tutorial - Wednesday 1st August 7:30pm AEST via Zoom.

Week 5 - 06 Aug 2018

Module/Topic	Chapter	Events and Submissions/Topic
Module 2 Steps and techniques for optimising B mode images.	Lectures available.	

Vacation Week - 13 Aug 2018

Module/Topic	Chapter	Events and Submissions/Topic
This is vacation week - and you have the opportunity to now revise content.		

Week 6 - 20 Aug 2018

Module/Topic	Chapter	Events and Submissions/Topic
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Module 2 B mode imaging artifacts and their ultrasound appearance.	Lecture content and additional reading will be supplied which compliment the prescribed text (Artifacts in Diagnostic Medical Ultrasound by Martin Necas, 2012). Refer to the week 6 module overview document for the specific chapters to read.	
Week 7 - 27 Aug 2018		
Module/Topic	Chapter	Events and Submissions/Topic
Module 3 Doppler Ultrasound (Pulsed wave Colour, pulsed wave Power, pulsed wave Spectral Doppler) and imaging applications.	Lectures available.	
Week 8 - 03 Sep 2018		
Module/Topic	Chapter	Events and Submissions/Topic
Module 3 Doppler Ultrasound (Pulsed wave Colour, pulsed wave Power, pulsed wave Spectral Doppler) and imaging applications.	Lectures available.	Tutorial - Wednesday 5th September 7:30pm AEST via Zoom.
Week 9 - 10 Sep 2018		
Module/Topic	Chapter	Events and Submissions/Topic
Module 3 Doppler Ultrasound (Pulsed wave Colour, pulsed wave Power, pulsed wave Spectral Doppler) and imaging applications.	Lectures available.	Compulsory Residential School Saturday September 15th. 9am to 4pm. Attendance is required, and a laboratory manual must be submitted for assessment. Brisbane, Mackay, Sydney CQU campuses (Perth and Melbourne availability pending student locations at end of enrollment period).
Week 10 - 17 Sep 2018		
Module/Topic	Chapter	Events and Submissions/Topic
Module 4 Bioeffects and safety issues in Ultrasound.	Module 4 Lectures and notes are provided.	
Week 11 - 24 Sep 2018		
Module/Topic	Chapter	Events and Submissions/Topic
Module 4 Bioeffects and safety issues in Ultrasound.	Module 4 Lectures and notes are provided.	Online formative quiz questions will be available this week.
Week 12 - 01 Oct 2018		
Module/Topic	Chapter	Events and Submissions/Topic
Revision week and online test week.		The online test opens Friday October 5th at 9:00am AEST and closes Wednesday 10th October 9:00am AEST. Lab manual completion relating to residential school Due: Week 12 Friday (5 Oct 2018) 11:00 pm AEST
Review/Exam Week - 08 Oct 2018		
Module/Topic	Chapter	Events and Submissions/Topic
		The online test that opened last Friday closes this week. Online Test Due: Review/Exam Week Wednesday (10 Oct 2018) 9:00 am AEST

Term Specific Information

This unit contains pre-recorded lectures introducing you to the ultrasound applications of B mode, Colour Doppler, and Spectral Doppler modes of ultrasound.

There will be tutorial sessions hosted by the lecturer via Zoom. These will be recorded and subsequently posted under the corresponding week on Moodle. See Moodle for dates and times of these tutorials.

The tutorials will focus on clarification of unit concepts and provide opportunity to study ultrasound images that test recognition of imaging artifacts.

Students are expected to spend on average 10-12 hours of time each week in their studies for this unit.

A suggested time budget for weekly study is:

2-3 hours for watching recorded lectures and taking notes

1 hour for completing assigned reading

1 hour for participation in and review of online tutorials

2 hours for creating and reviewing study notes to meet your learning goals

1 - 2 hours for revision and preparation for the final examination

1/2 hour for discussion forum reading and participation

1 hour for additional reading and completing review questions

1/2 hour preparation for the Lab Residential School / watching additional teaching videos for each module

The Residential School is an opportunity to use an ultrasound machine and practice image optimisation techniques.

Attendance is compulsory. You will need to allow time to travel and attend campus from 9am to 4pm. There will be activities and questions to complete both in lab time and afterwards. You will apply theoretical knowledge learned to a practical setting for various body organs. You may be requested to act as a patient model for your peers. The Residential School Manual will need to be completed and uploaded with questions answered as part of the summative assessment for this term. You will need to allow extra time in your week to complete and submit your lab manual after the residential school.

On Moodle there is a Q&A forum. You can post questions relevant to the content being studied and these will be monitored and answered by teaching staff.

Alternatively you can email a question directly to b.wylie@cqu.edu.au.

My on campus phone contact is (07) 3023 4244

Assessment Tasks

1 Online Test

Assessment Type

Online Test

Task Description

Every health professional performing ultrasound is required to have a body of knowledge that is relevant to their scope of practice. Ultrasound science forms the fundamental basis upon which a clinical understanding is built. Health professionals have an ethical responsibility to carry out ultrasound accurately and safely with minimal diagnostic and health risk to the patient. To demonstrate your understanding and knowledge of this unit, you are required to complete an online test.

- An online test will be conducted to assess your understanding of content in this unit.
- This is one of two assessments that must be passed to then pass the unit overall.
- The test will be online and must be accessed through the 'assessment tab' on Moodle and will comprise of 10 questions, each of 10 marks (100 marks in total).
- Questions will be composed of multiple components, multiple choice, short answer, image interpretation, or a longer answer format. If a question requires a medium length response you will have up to 20 lines available for written answers.
- As the test is online and open book, you will find it useful to have produced your own notes from the lectures.
- Questions will be randomised to allow tests to be different for each student.
- Image viewing questions may be included.
- Questions will be randomised to allow tests to be different for each student. Image viewing questions may be included.

- Questions may be drawn from any content presented up to and including week 12, including but not limited to lectures, content from tutorials, the lab manual, and additional reading.
- The assessment is to be undertaken as an individual. As with all other university assessments, colluding with other students on non-group work tasks is considered academic misconduct.
- The test will be open for 2 hours once started (allowing 12 minutes per question) and only one attempt is allowed. Please be sure to start the test at least 2 hours before the closing time so that it can be completed by the close time. At the closing time or at completion of 2 hours you MUST save and submit the test, otherwise all the attempted questions will be lost. Once started the test cannot be paused, stopped or re-started. Once you have completed the test, it cannot be re-taken.

Assessment Due Date

Review/Exam Week Wednesday (10 Oct 2018) 9:00 am AEST

The Online test will be open from Friday October 5th until Wednesday the 10th October (5 days)

Return Date to Students

Exam Week Wednesday (17 Oct 2018)

Weighting

Pass/Fail

Minimum mark or grade

60

Assessment Criteria

Students need to obtain a minimum score of 60% in the online test to be awarded a pass for this assessment piece.

Responses are assessed according to:

Use correct descriptors and correct professional terminology relevant to the question asked

The ability to provide detailed answers that correctly describe physical principals relevant to the question asked

The ability to identify and interpret imaging factors that are inappropriately optimised

the ability to correctly recognise imaging artifacts and succinctly compose appropriate responses based on learning from the unit

Referencing Style

- [Vancouver](#)

Submission

Online

Submission Instructions

The submit button must be activated by the student upon completion of the test on Moodle prior to the test close time.

Learning Outcomes Assessed

- Apply knowledge of ultrasound interaction with tissue and practical skills to acquire diagnostic ultrasound images
- Assess and solve problems with images in relation to artifacts and diagnostic usefulness
- Identify and manage safety issues in medical ultrasound.

Graduate Attributes

- Knowledge
- Communication
- Cognitive, technical and creative skills
- Research
- Ethical and Professional Responsibility

2 Lab manual completion relating to residential school

Assessment Type

Practical Assessment

Task Description

Ultrasound is a practical health profession, hence laboratory experience is vital to being able to develop the skills required to acquire and optimise an image.

The practical residential school day provides you with hands-on tuition so that you can manipulate both transducer and imaging parameters.

To demonstrate your understanding of image acquisition and optimisation the laboratory manual requires you to optimise B-Mode and Doppler images and requires you to answer questions relevant to the practice of ultrasound.

- The residential school must be fully attended to pass this unit.
- All questions in the residential school lab manual must be answered and a completed lab manual submitted via

- the assessment tab in Moodle by Friday 5th October by 23:00 AEST (11pm).
- There are questions within the lab manual which you will need to complete on the day, or in the weeks after.
- The completed lab manual then needs to be uploaded and submitted via the assessment tab in Moodle.
- This assessment is PASS/FAIL.

Assessment Due Date

Week 12 Friday (5 Oct 2018) 11:00 pm AEST

Return Date to Students

Exam Week Wednesday (17 Oct 2018)

Weighting

Pass/Fail

Minimum mark or grade

50% and all sections must be completed.

Assessment Criteria

To obtain a pass mark you must demonstrate:

- Correct application of lecture content and equations to explain the benefits and limitations of ultrasound equipment and modes
- Well considered and detailed discussion of physical principals with correct and consistent professional terminology
- Application of professional terminology to ultrasound images and various artifacts in ultrasound
- The ability to consistently describe the correct relationship between various imaging controls and quality aspects of ultrasound images
- Completeness of answers and tasks provided
- Correct recognition and application of terminology to ultrasound images

Referencing Style

- [Vancouver](#)

Submission

Online

Submission Instructions

Word or PDF files are acceptable for submission. Answers should be typed into the digital lab manual following the residential school attendance. Ultrasound images acquired can be of a large file size. Once inserted into the lab manual please convert the file to PDF to reduce size where possible. Please do not submit the images separately.

Learning Outcomes Assessed

- Apply knowledge of ultrasound interaction with tissue and practical skills to acquire diagnostic ultrasound images
- Assess and solve problems with images in relation to artifacts and diagnostic usefulness
- Compare the different modes of ultrasound and their applications in medical ultrasound
- Identify and manage safety issues in medical ultrasound.

Graduate Attributes

- Knowledge
- Communication
- Cognitive, technical and creative skills
- Self-management
- Ethical and Professional Responsibility

Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the [Student Academic Integrity Policy and Procedure](#). This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

What is a breach of academic integrity?

A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

Why is academic integrity important?

A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

Where can I get assistance?

For academic advice and guidance, the [Academic Learning Centre \(ALC\)](#) can support you in becoming confident in completing assessments with integrity and of high standard.

What can you do to act with integrity?



Be Honest

If your assessment task is done by someone else, it would be dishonest of you to claim it as your own



Seek Help

If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)



Produce Original Work

Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem