MEDS20009 *Science and Instrumentation of Ultrasound*
Term 3 - 2019

Profile information current as at 14/05/2024 11:38 am

General Information

Overview
This unit aims to develop knowledge and understanding of the science and instrumentation of clinical ultrasound to enable you to produce images to support clinical decision making. The unit emphasis will be on safety and quality assurance. You are required to attend a compulsory ultrasound skills workshop to complete this unit. In the practical workshop 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 3 - 2019

- 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" feedback

Feedback
Students with no ultrasound background stated physics presented them with a lot of new concepts which was clearly explained.

Recommendation
Continue to present complex concepts using clear explanations and examples.

Feedback from "Have your say" feedback

Feedback
Students commented that the order of learning ultrasound science and instrumentation concepts were not aligned in Module 3.

Recommendation
Module 3 has been re-ordered. Further restructuring of the content will be done when this unit is divided into four short courses.

Feedback from "Have your say" feedback

Feedback
Students would like a residential school with hands on ultrasound training done earlier in the term to help them understand taught concepts.

Recommendation
Consider a non-compulsory Residential school to be run shortly after census date to give the students a hands-on experience earlier in the semester to facilitate a deeper understanding of the theoretical concepts covered in the unit.

Unit Learning Outcomes

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

1. Acquire ultrasound images of sufficient quality to support clinical decision making.
2. Characterise and control problems in relation to imaging artifacts in ultrasound.
3. Discuss the underpinning concepts of image acquisition, benefits and limitations of ultrasound equipment and modes of 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

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

MEDS20009

Prescribed

Artifacts in Diagnostic Medical Ultrasound, Volume 1, Grayscale Artifacts 1st (2012)
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
Sydney , NSW , Australia
ISBN: 9780987292100
Binding: eBook

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. However, if you prefer a paper textbook, they are available at a reduced price at the CQUni Bookshop here: http://bookshop.cqu.edu.au (search on the Unit code)

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Microphone and camera to attend the Zoom sessions

Referencing Style

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

Teaching Contacts

Kathleen Sweeney Unit Coordinator
k.sweeney@cqu.edu.au

Schedule

Module 1 - Week 1 - 11 Nov 2019

Module/Topic	Chapter	Events and Submissions/Topic
• Introduction to sound wave physics • Sound wave parameters • Pulsed echo principle	Online lectures and reading material Chapter 2 "The Physics and Technology of Diagnostic Ultrasound" (R. Gill) online	Zoom Tutorial: **Wednesday 7:00 pm AEST.**

Module 1 - Week 2 - 18 Nov 2019

Module/Topic	Chapter	Events and Submissions/Topic
Sound Wave Interactions: • Attenuation - absorption, reflection, refraction, scattering • Acoustic impedance	Online lectures and reading material	

Module 1 - Week 3 - 25 Nov 2019

Module/Topic	Chapter	Events and Submissions/Topic
• Ultrasound beam geometry • Transducer technology • Types of transducers	Online lectures and reading material	

Module 2 - Week 4 - 02 Dec 2019

Module/Topic	Chapter	Events and Submissions/Topic
• Introduction to ultrasound imaging modes. • Steps and techniques for optimising B mode images.	Online lectures and reading material	Zoom Tutorial: **Wednesday 7:00 pm AEST** Lab induction information is provided on Moodle this week. A hands-on scanning day in the ultrasound lab will be offered during week 2. It will introduce basic ultrasound concepts and probe handling skills. The specific day and campus sites will be dependent on student numbers and resident state and will be finalized prior to census day. It will not be mandatory to attend. The Scanning day will run **for 4 hours** (9am to 1pm), and can be aligned with MEDS20013. See Moodle for more details.

Vacation Week - 09 Dec 2019

Module/Topic	Chapter	Events and Submissions/Topic
This is vacation week - Enjoy a vacation week but don't forget to keep revising		

Module 2 - Week 5 - 16 Dec 2019

Module/Topic	Chapter	Events and Submissions/Topic
Ultrasound beam resolution: • Spatial • Temporal • Contrast	Online lectures and reading material	Zoom Tutorial: **Wednesday 7:00 pm AEST**

Module 2 - Week 6 - 23 Dec 2019

Module/Topic	Chapter	Events and Submissions/Topic
B mode imaging artifacts and their ultrasound appearance: • Attenuation artifacts • Depth artifacts • Beam dimension artifacts • Beam path artifacts	Text book : Artifacts in Diagnostic Medical Ultrasound. Volume 1 Grayscale Artifacts Online lectures and reading material	

Module 3 - Week 7 - 06 Jan 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Doppler Principles • Colour Doppler • Colour Doppler artifacts	Online lectures and reading material	Zoom tutorial - **Wednesday 7:00 pm AEST.**

Module 3 - Week 8 - 13 Jan 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Spectral Doppler Ultrasound • Spectral Doppler artifacts	Online lectures and reading material	

Module 3 - Week 9 - 20 Jan 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Power Doppler Ultrasound • Doppler Ultrasound imaging applications	Online lectures and reading material	

Module 4 - Week 10 - 27 Jan 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Bioeffects • Safety issues in ultrasound practice	Online lectures and reading material	Zoom tutorial - **Wednesday 7:00 pm AEST.** Compulsory Residential School **9:00 am to 4:00 pm**. The specific day and campus sites will be dependent on student numbers and resident state and will be finalized prior to census day. It can be aligned with MEDS20013 Attendance is mandatory, and a laboratory manual must be submitted for assessment.

Module 4 - Week 11 - 03 Feb 2020

Module/Topic	Chapter	Events and Submissions/Topic
Quality Assurance in ultrasound practice	Online lectures and reading material	The 2 hour online test **opens Monday at 8:00am AEST for 8 days** **Lab Manual submission due Friday 4:00pm AEST** **Online Test** Due: Week 11 Tuesday (4 Feb 2020) 4:00 pm AEST **Lab manual completion relating to residential school** Due: Week 11 Friday (7 Feb 2020) 4:00 pm AEST

Revision - Week 12 - 10 Feb 2020

Module/Topic	Chapter	Events and Submissions/Topic
Revision week and online test.		The online test closes **Tuesday at 16:00 AEST**

Term Specific Information

My name is Kathleen Sweeney, your unit coordinator this term. I am an Accredited Medical Sonographer qualified in general and cardiac ultrasound with over 25 years experience. I hold an academic position within CQU as well as working clinically two days per week.
Don't hesitate to contact me either before or during term if you have any questions about the Scanning day, Residential School or anything else.
I am on the Sydney campus Tuesday, Wednesday and Friday but am contactable most days via email.
email: k.sweeney@cqu.edu.au phone: (02) 93245093

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 the content in this unit.
- This is one of the two assessments (the second being combined attendance at the compulsory Residential School plus submission of Lab Manual) that must be passed to pass the unit overall.
- The test will be online and must be accessed through the 'assessment tab' on Moodle and will comprise of 40 questions, 2 or 4 marks per question (100 marks in total).
- Questions will be composed of multiple components, multiple choice, short answer, image interpretation, or a longer answer format.
- 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 from a question bank 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 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 the 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
Week 11 Tuesday (4 Feb 2020) 4:00 pm AEST
The 2 hour Online test will be open from Monday 8:00am week 11 and closes Tuesday 4:00pm week 12

Return Date to Students
Exam Week Friday (21 Feb 2020)
Return via Moodle

Weighting
Pass/Fail

Minimum mark or grade
50

Assessment Criteria
Students need to obtain a minimum score of 50% in the online test to be awarded a pass for this assessment.

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

- Characterise and control problems in relation to imaging artifacts in ultrasound.
- Discuss the underpinning concepts of image acquisition, benefits and limitations of ultrasound equipment and modes of ultrasound.
- 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 is compulsory and 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 Saturday 08th February by 22:00 AEST (10 pm).
- There are questions within the lab manual which you will need to complete on the day, or in the week 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 11 Friday (7 Feb 2020) 4:00 pm AEST
Submitted through the assessment tab on Moodle

Return Date to Students
Exam Week Friday (21 Feb 2020)
Returned via Moodle

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 principles 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
- Attend compulsory Residential School

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. You can submit the images separately.

Learning Outcomes Assessed

- Acquire ultrasound images of sufficient quality to support clinical decision making.
- Characterise and control problems in relation to imaging artifacts in ultrasound.
- Discuss the underpinning concepts of image acquisition, benefits and limitations of ultrasound equipment and modes of 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