MEDS12001 *Physics of Ultrasound*
Term 1 - 2018

Profile information current as at 01/07/2022 02:28 pm

General Information

Overview
You will be introduced to the principles of ultrasound physics and instrumentation in this unit. Quality Assurance and recognition of artefacts will also be covered. The knowledge and skills learnt from this unit are integral to all concurrent and subsequent sonography units and the foundation from which you will build your image acquisition, recognition and assessment skills. You will apply your knowledge and skills of physics principles in the laboratory setting using ultrasound equipment.

Details
Career Level: *Undergraduate*
Unit Level: *Level 2*
Credit Points: *6*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites
Prerequisite MEDI11002 Physics for Health Sciences AND MEDS11001 Fundamentals of Sonographic Practice
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 1 - 2018

- Brisbane
- Mackay
- Melbourne
- Perth
- Sydney

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).

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 Undergraduate 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. **Written Assessment**
Weighting: 40%
2. **Practical Assessment**
Weighting: Pass/Fail
3. **Examination**
Weighting: 60%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the University's Grades and Results Policy for more details of interim results and final grades.

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
Video sound quality

Recommendation
Consider recording videos on different equipment

Feedback from Have your say

Feedback
Written assessment needs rubric

Recommendation
Consider composing rubric for the written assessment.

Feedback from Have your say

Feedback
Content focussed on general ultrasound, not echo

Recommendation
Consider including more echo- centric examples including images and clinical scenarios.

Unit Learning Outcomes

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

1. Apply the physical principles of diagnostic ultrasound to practical problems
2. Evaluate the components and performance of diagnostic ultrasound equipment
3. Apply knowledge of ultrasound physics and practical skills to acquire diagnostic ultrasound images
4. Discuss the principles of ultrasound techniques, Doppler ultrasound and its application in medical ultrasound.
5. Interpret the causes of, and apply problem solving skills to reduce, sources of artefacts on an ultrasound image
6. Describe safety issues in medical ultrasound

This unit will be one of the core units in the Medical Sonography Course which is externally accredited by the Australian Sonographers Accreditation Registry (ASAR), an external professional regulatory body. Intended learning outcomes have been linked to:
ASAR Required Graduate Competency Outcomes for General Sonography Accreditation Standards 1.2,
Deliver safe, patient centred services- 1, 2, 3, 4, 5, 6 and 7
Practice within professional and ethical frameworks- 2, 6 and 7
Contribute to workplace health and safety and quality assurance- 2, and 7

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	5	6

Assessment Tasks	Learning Outcomes					
	1	2	3	4	5	6
1 - Written Assessment - 40%	•	•	•	•	•	•
2 - Practical Assessment - 0%	•	•	•			
3 - Examination - 60%	•	•		•	•	•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes					
	1	2	3	4	5	6
1 - Communication	•	•	•	•	•	•
2 - Problem Solving	•	•	•	•	•	•
3 - Critical Thinking						
4 - Information Literacy	•	•	•	•	•	•
5 - Team Work						
6 - Information Technology Competence	•	•	•	•	•	•
7 - Cross Cultural Competence						
8 - Ethical practice						
9 - Social Innovation						
10 - 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	9	10
1 - Written Assessment - 40%	•	•		•		•				
2 - Practical Assessment - 0%	•	•	•	•		•				
3 - Examination - 60%	•	•		•						

Textbooks and Resources

Textbooks

MEDS12001

Prescribed

SONOGRAPHY: PRINCIPLES AND INSTRUMENTS, Ninth Edition
9th Edition (2016)
Authors: Frederick Kremkau
Elsevier
St. Louis , Missouri , USA
ISBN: 978-0-323-32271-3
Binding: Hardcover

Additional Textbook Information
This text will supplement lecture material. E-book or hardcopy acceptable.

View textbooks at the CQUniversity Bookshop

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)

Referencing Style

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

Teaching Contacts

Afrooz Najafzadeh Abriz Unit Coordinator
a.najafzadehabriz@cqu.edu.au

Schedule

Week 1 - Pulsed Echo Principle and Sound Parameters - 05 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
PULSE ECHO PRINCIPLE AND SOUND PARAMETERS Back to Basics Pulse Echo Principle Sound Parameters Maths Concepts	Kremkau Chapter 1 & 2	No Zoom

Week 2 - Pulsed Ultrasound and Parameters related to Pulsed Ultrasound - 12 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Pulsed Ultrasound and Parameters related to Pulsed Ultrasound: Pulsed Ultrasound PRP and PRF PD, DF, SPL, Bandwidth	Kremkau Chapter 2	Zoom Tutorial

Week 3 - Sound Interaction with Matter - 19 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Sound interaction with matter: Amplitude, Power and Intensity Attenuation and Absorption Reflection and Acoustic Impedance Types of Reflection Refraction Ranging	Kremkau Chapter 2	Zoom Tutorial Lab Session 1

Week 4 - Transducers, Beam Geometry and Instrumentation - 26 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Transducers, Beam Geometry and Instrumentation: Transducer Construction Beam Geometry Instrumentation	Kremkau Chapter 3 & 4	Zoom Tutorial

Week 5 - Resolution - 02 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Resolution: Lateral Resolution Axial Resolution Contrast Resolution Temporal Resolution	Kremkau Chapter 3 & 4	Zoom Tutorial Lab Session 2

Vacation Week - 09 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - Revision - 16 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Revision		Zoom Tutorial

Week 7 - Artifacts - 23 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Artifacts: Propagation Attenuation Spectral Doppler Artifacts Colour Doppler Artifacts	Kremkau Chapter 6	No Zoom Tutorial Written Assessment due **Written Assesssment** Due: Week 7 Monday (23 Apr 2018) 2:00 pm AEST

Week 8 - Haemodynamics and The Doppler Principle - 30 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Haemodynamics and The Doppler Principle: Flow The Doppler Effect	Kremkau Chapter 5	Zoom Tutorial

Week 9 -Doppler Imaging - 07 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
Doppler Imaging: Colour Doppler Displays Spectral Doppler Displays	Kremkau Chapter 5	Zoom Tutorial

Week 10 -Safety and Quality Assurance - 14 May 2018

Module/Topic	Chapter	Events and Submissions/Topic

Safety and Quality Assurance: Performance Measurements Output Measurements Bio-effects Safety	Kremkau Chapter 7	Zoom Tutorial Lab Session 3 Upload Lab Manual **Practical Laboratory Sessions and Lab Manual completion** Due: Week 10 Friday (18 May 2018) 12:00 pm AEST

Week 11 - Contemporary Imaging - 21 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
Contemporary Imaging: Coded Excitation Harmonic Imaging Panoramic Imaging Spatial Compounding Parallel Processing Elastography Cardiac Strain Imaging	Kremkau Chapter 4: Contemporary Features	Zoom Tutorial

Week 12 - Review and Consolidation - 28 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
Review and Consolidation		Zoom Tutorial

Review/Exam Week - 04 Jun 2018

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 11 Jun 2018

Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

Students are expected to spend on average 10-12 hours of time each week in their study activities for this unit. A suggested time budget for weekly study is:
· 2- 2.5 hours for watching recorded lectures and taking notes
· 1-1.5 hours for completing assigned reading
· 0.5-1 hour for completing other posted learning activities
· 2-2.5 hours for creating study notes to meet weekly learning goals using lectures and readings
· 0.5 hour for adding week specific content to your 'cheat sheet'
· 1-1.5 hours for applying weekly content using posted end-of-chapter questions
· 0.5 hour for working on posted tutorial questions in preparation for tutorial
· 1 hour for participation in online tutorial
· 1-2 hours for assignment preparation and/or revision for final examination
Tutorials are interactive sessions where your participation enables you to check your understanding of and your ability to apply the week's concepts and for you to build your skills in responding to test questions. Your regular participation strongly supports your success in the unit. While online tutorials will be recorded, these recordings are not intended to replace your active participation in live sessions.
Three (3) physics labs will be held on Thursdays in weeks 3, 5 and 10.
The unit co-ordinator for MEDS12001 Term 1, 2018 is to be advised. Deborah Dahdah and Michelle Fenech will be assisting with the unit co-ordination and conducting some lectures and tutorials.
The best mode of contact is by email: d.dahdah@cqu.edu.au. Please use email whenever possible.
Deborah's CQUniversity Australia phone number is 02 9324 5070.
Michelle's CQUniversity Australia phone number is (07) 3295 1180.
The online tutorials are an opportunity to ask questions, gain feedback and join in discussions concerning theoretical concepts and assessment tasks. These will be recorded for those unable to attend and posted on the unit Moodle page.
Access to the internet is required to undertake this unit, as unit materials, tutorials and updates will be provided via Moodle, Zoom and email. It is important to regularly check your student email as updates about the unit will be sent from the unit co-ordinator via email.
Zoom Tutorials will be held weekly on Monday. These will be recorded for those unable to attend and posted on the unit Moodle page.

Assessment Tasks

1 Written Assesssment

Assessment Type
Written Assessment

Task Description
There will be five (5) short-answer questions worth 20 marks each.
The questions will be based on the Laboratory Sessions (including the images obtained during Labs 1 and 2) and lecture and tutorial material up to the submission date.
The maximum word count is 1000 +/- 10%, excluding tables, charts, diagrams and reference list.
As a sonographer, it is imperative you understand the physical principles which create the images you acquire and the potential artifacts incurred during the sonographic imaging process. This understanding will help you to improve your image acquisition and quality and will help in the diagnostic process. A sonographer must be able to use ultrasound equipment safely and be familiar with the safety guidelines set by any governing bodies.

Assessment Due Date
Week 7 Monday (23 Apr 2018) 2:00 pm AEST

Return Date to Students
Week 9 Monday (7 May 2018)
General feedback will be provided up to 2 weeks after submission.

Weighting
40%

Minimum mark or grade
50%

Assessment Criteria
Answers for full marks for each question should include:

- Exceptional answer, clear, concise, detailed with direct reference to properly labelled images acquired by student in labs and diagrams if applicable. Images are explained and used to enhance answer.
- Correct content and demonstration of understanding of concept and its practical use
- Explanations supported by correct physics equations when required with correct units described
- Grammar and spelling are flawless and correct use of physics and sonographic terminology
- Presentation of content and images is organised and professional
- Submitted by due date and time, as a 5% penalty per day will be applied for late submissions as per policy and procedures of CQUniversity.
- Overall Presentation - Cover page required with title, Name, student number
- Accurate and correct reference style

Referencing Style

- Vancouver

Submission
Online

Submission Instructions
Online via unit Moodle site.

Learning Outcomes Assessed

- Apply the physical principles of diagnostic ultrasound to practical problems
- Evaluate the components and performance of diagnostic ultrasound equipment
- Apply knowledge of ultrasound physics and practical skills to acquire diagnostic ultrasound images
- Discuss the principles of ultrasound techniques, Doppler ultrasound and its application in medical ultrasound.
- Interpret the causes of, and apply problem solving skills to reduce, sources of artefacts on an ultrasound image
- Describe safety issues in medical ultrasound

Graduate Attributes

- Communication
- Problem Solving
- Information Literacy
- Information Technology Competence

2 Practical Laboratory Sessions and Lab Manual completion

Assessment Type
Practical Assessment

Task Description
In small groups (3-4 people), you will be required to collaboratively perform tasks during the practical Laboratory sessions and obtain ultrasound images that will assist to answer set questions, and then individually submit the completed Laboratory manual.
These labs will provide an opportunity for you to explore the physical principles of ultrasound and develop your knowledge of machine instrumentation and controls under the guidance of your tutor.
During the labs you will be required to take images, and observe the effect of changing machine parameters on the resultant image.
You will be required to complete questions in your lab manual during the lab session. The questions are designed to help you understand the physical properties of ultrasound and how that knowledge is used to inform the practical production of diagnostic medical images.
Students may work in teams to acquire images. Image sharing within your lab group is permitted.
Please note the following excerpt from the University Assessment of Coursework Procedures: '...students who fail a single assessment task in a pass-fail course, or who fail a pass-fail component of a graded course will be deemed to have failed that course'.
You will be required to UPLOAD your lab manual answers to the unit Moodle page via the link provided in the assessment block. Non-attendance at a lab for any reason will require you to complete the learning and practical exercises, with consideration to lab availability, for submission to the assessment link.
Bring a USB stick to lab to save your images.
It is a highly recommended component of the unit to attend the Laboratory practical sessions in order to meet the Learning Outcomes.

Assessment Due Date
Week 10 Friday (18 May 2018) 12:00 pm AEST

Return Date to Students
Week 12 Friday (1 June 2018)
General feedback will be provided up to 2 weeks after submission.

Weighting
Pass/Fail

Minimum mark or grade
Pass

Assessment Criteria
Answers for full marks for each question should include:
· Exceptional answer, clear, concise, detailed with direct reference to properly labelled images acquired by student in labs and diagrams if applicable. Images are explained and used to enhance answer.
· Correct content and demonstration of understanding of concept and its practical use
· Explanations supported by correct physics equations when required with correct units described
· Grammar and spelling are flawless and correct use of physics and sonographic terminology
· Presentation of content and images is organised and professional
· Submitted by due date and time. It is not possible to apply a 5% per day late submission penalty to a pass/fail assessment. In the absence of an approved extension, late submission will result in a fail grade for this assessment item.
· Overall Presentation - Cover page required with title, Name, student number, group members for Lab sessions required.

Referencing Style

- Vancouver

Submission
Online

Submission Instructions
Online via the unit Moodle site.

Learning Outcomes Assessed

- Apply the physical principles of diagnostic ultrasound to practical problems
- Evaluate the components and performance of diagnostic ultrasound equipment
- Apply knowledge of ultrasound physics and practical skills to acquire diagnostic ultrasound images

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Information Technology Competence

Examination

Outline
Complete an invigilated examination.

Date
During the examination period at a CQUniversity examination centre.

Weighting
60%

Length
120 minutes

Minimum mark or grade
50% minimum pass mark

Exam Conditions
Closed Book.

Materials
Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments).
Calculator - non-programmable, no text retrieval, silent only

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