MEDI12002 *Science and Instrumentation 1*
Term 1 - 2019

Profile information current as at 26/04/2024 12:50 pm

All details in this unit profile for MEDI12002 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 is the first of three units where knowledge is developed and built on in each subsequent unit, and applied in the clinical environment. You will be introduced to the equipment, instruments and science necessary to produce a digital radiographic image. You will learn about technical factor selection, their impact on the image and the acquisition, manipulation and processing of the final image. All material learnt in this unit is reinforced in a simulated setting. A digital radiological laboratory and imaging workstations linked to PACS will allow for experiential learning.

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
Pre-requisites MEDI11001 Fundamentals of Imaging Professions, and MEDI11002 Physics for Health Sciences, and ESSC11004 Study and Research Skills for Health Sciences (replacing SCIE11023) Co-requisite MEDI12001 Radiation Science
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 - 2019

- Mackay

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. **In-class Test(s)**
Weighting: 40%
2. **In-class Test(s)**
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 Student survey

Feedback
Repetition and consistency of content throughout lectures, labs and tutorials week-to-week assisted learning. Hands-on lab time was helpful.

Recommendation
Maintain this format of content delivery.

Feedback from Coordinator self-reflection, student survey.

Feedback
The new textbook did not address some topics to the required depth, although it was useful for other topics. Supplementation with other readings was still often required.

Recommendation
Review textbook and additional resources used.

Feedback from Coordinator self-reflection, student survey.

Feedback
Tutorials: 1.5hrs allowed sufficient time; discussion of scenario-based questions was helpful; viewing images from labs should be done prior to tutorial.

Recommendation
Hold retrospective tutorials to allow extra time for students to review lab images and prepare written answers to discussion questions. Reiterate to students the benefit of coming prepared to tutorials. Consider spending more of the time on scenario-based questions.

Feedback from Student feedback

Feedback
Photos of equipment set-ups that were provided some weeks with the lab instructions were helpful.

Recommendation
Continue to provide visual aids with the written lab instructions.

Unit Learning Outcomes

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

1. Perform radiographic imaging in a safe and technically correct manner in a simulated PACS-integrated digital radiographic environment.
2. Outline the construction and operation of various digital radiographic image receptors and processing systems.
3. Detail the processes of image acquisition, processing and display for digital radiography.
4. Evaluate the technical aspects of radiographic image appearances.
5. Control the technical aspects of radiographic image appearances.

This unit supports your ability to meet the following components of the Medical Radiation Practice Board of Australia's Professional Capabilities for Medical Radiation Practice:
Domain 4:
1. Implement safe radiation practice appropriate to their division of registration.
5. Safely manage radiation and radioactivity in the environment.
Domain 5:
2. Apply principles of medical radiation physics and instrumentation.
Domain 5A:
1. Implement and evaluate general radiography examinations for a range of patient/client presentations and complexities.

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
1 - In-class Test(s) - 40%	•			•	•
2 - In-class Test(s) - 60%	•	•	•	•	•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes				
	1	2	3	4	5
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 - In-class Test(s) - 40%	•	•		•		•				
2 - In-class Test(s) - 60%	•	•		•		•				

Textbooks and Resources

Textbooks

MEDI12002

Prescribed

Essentials of Radiographic Physics & Imaging
Edition: 2nd (2016)
Authors: James Johnston and Terri Fauber
Elsevier
St. Louis , Missouri , USA
ISBN: 978-0-323-33966-7
Binding: Hardcover

Additional Textbook Information
This textbook is required for all three of the Science & Instrumentation units across Years 2 and 3 of the course plus MEDI12001 Radiation Science. Students should already have purchased this book for MEDI12001. Students may use either the hard copy or e-book version of this text. The e-book version of the text allows both online (web-based) and offline (downloaded copy) access to the book and has no expiry date. It is usable on both computers and tablets (specifically iPads and Android OS). The hardcopy textbook is available through the University Bookshop here: http://bookshop.cqu.edu.au (search on the Unit code) The e-book version of this text can be purchased at the publisher's Vital Source online store using the eText ISBN: 9780323339711.

IT Resources

You will need access to the following IT resources:

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

Referencing Style

All submissions for this unit must use the referencing style: Harvard (author-date)
For further information, see the Assessment Tasks.

Teaching Contacts

Linden Williams Unit Coordinator
l.williams@cqu.edu.au

Schedule

Week 1 - 11 Mar 2019

Module/Topic	Chapter	Events and Submissions/Topic
Image properties and the imaging process • differential attenuation • the radiograph as an attenuation map • image properties (visibility, density, brightness, contrast, unsharpness or blur, spatial resolution, distortion) • imaging workflow	Prescribed text: • Chapter 8 pp. 82-88 • Chapter 9 pp. 92-100 Refer to Moodle for any additional readings	Lab & tutorial: • orientation to the radiographic laboratory and PACS • image properties

Week 2 - 18 Mar 2019

Module/Topic	Chapter	Events and Submissions/Topic
Image Geometry - distortion • radiographic image geometry • positioning of the beam, part and image receptor to control radiographic appearances of spatial relationships • effects of image geometry on the image (superimposition, magnification and shape distortion)	Refer to Moodle for additional readings	Lab & tutorial - geometric distortion

Week 3 - 25 Mar 2019

Module/Topic	Chapter	Events and Submissions/Topic
Image Geometry - unsharpness • line focus principle • effective vs actual focal spot size • effect of focal spot size • effect of image geometry • impact on unsharpness and visibility • spatial resolution • absorption blur and visibility	Prescribed text: • Chapter 5 pp.52-55 • Chapter 10 pp.124-125 'Focal Spot Size' • Chapter 9 pp.96-97 'Spatial Resolution' Refer to Moodle for any additional readings	Lab & tutorial - unsharpness and spatial resolution

Week 4 - 01 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
Scatter on the radiographic image • control of scatter production • collimation and positive beam limitation • control of scatter to the image receptor • air gap technique • grid basics • effect of scatter on visibility • contrast resolution	Prescribed text: Chapter 11 Refer to Moodle for any additional readings	Lab & tutorial - scatter on images

Week 5 - 08 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
[assessment week - no new content]		In-class Test 1 No lab Tutorial - in-class test review

Vacation Week - 15 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
Break week		

Week 6 - 22 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
Control of scatter using grids • grid construction and types • grid use • grid errors • technical factor compensation • grid metrics	Prescribed text: Chapter 11 Refer to Moodle for any additional readings	Lab & tutorial - grid use

Week 7 - 29 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic

Technical factor selection (1) • control of radiation quantity to the image receptor • exposure index and deviation index • control of differential attenuation • effects on the recorded image • noise, mottle and visibility • impacts of body part content and size	Prescribed text: Chapter 10 pp.117-124, 133-137 Refer to Moodle for any additional readings	Lab & tutorial - effects of mAs and kV change

Week 8 - 06 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
Technical factor selection (2) • SID changes and direct square law • anode heel effect • basics of automatic exposure control • technique chart basics • anatomical programming • tube rating charts and technical factor selection • control of tube heating	Prescribed text: • Chapter 5 pp.52-58 • Chapter 10 pp.125-127 'Source-to-Image Receptor Distance' • Chapter 13 pp.186-197 Refer to Moodle for any additional readings	Lab & tutorial - other determinants of beam quality and quantity

Week 9 - 13 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
Digital radiography, PACS and image display • properties of digital images • digital radiography process of acquisition, processing and display • display devices • visibility of displayed image • PACS systems and PACS workflow • DICOM standards	Prescribed text: • Chapter 9 pp.101-106 • Chapter 12 pp.156-172 Refer to Moodle for any additional readings	Lab & tutorial - digital image acquisition and display

Week 10 - 20 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
Digital radiographic image receptor systems • computed radiography • image reader • direct read radiography	Prescribed text: Chapter 12 pp.157-162 Refer to Moodle for any additional readings	Lab & tutorial - digital image acquisition

Week 11 - 27 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
Digital radiographic image processing • image histogram • image pre-processing and correction • image processing • impact of protocol selection on image appearances	Prescribed text: Chapter 12 pp.161-162 Refer to Moodle for any additional readings	Lab & tutorial - protocol selection and image appearances, post-processing

Week 12 - 03 Jun 2019

Module/Topic	Chapter	Events and Submissions/Topic
Revision/Consolidation		No lab Revision tutorial

Review/Exam Week - 10 Jun 2019

Module/Topic	Chapter	Events and Submissions/Topic
		In-class Test 2

Exam Week - 17 Jun 2019

Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

This unit is designed to be taken concurrently with MEDI12001 Radiation Science and MEDI12003 Imaging Procedures 1. Content from both of those units will be referred to and used to develop understanding of the content in this unit. Each week normally includes an on-campus lecture, lab and tutorial, all related to content for that week. 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:

- Lectures (in-class and recorded) - 2-3 hours
- Labs (preparation, lab time, PACS time) - 2 hours
- Tutorial preparation and participation - 2 hours
- Assigned reading - 1-2 hours
- Creating your own study notes to meet weekly learning goals using lectures, pre-recorded resources, tutorials and readings - 2-3 hours

Revision and preparation for in-class tests - 25 hours throughout term.

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 and active participation strongly supports your success in the unit.

Assessment Tasks

1 In-Class Test 1

Assessment Type
In-class Test(s)

Task Description
You will write an in-class test to demonstrate your ability to apply the concepts and use the terminology from Weeks 1 - 4 of the unit. All questions will be based on the posted weekly learning goals. Question tasks will be of a similar type to those discussed in weekly tutorials. These tasks may include analysis of projected diagrams, photographs and/or radiographs, creation of line diagrams to illustrate concepts, explanations and discussions.

This test is a closed-book assessment of 80 minutes duration. You will have five minutes perusal time prior to the allotted writing time. You will write the test under examination conditions as detailed in the Assessment Procedures. You will submit your test paper and rough paper at the end of the test period.

This test must be written at the timetabled date and time. As per the Assessment Procedures, this task is to be completed during a defined period. There is no opportunity to apply a late penalty. If you arrive late, you may enter the test room up to 30 minutes after the start of the test; however, you will still be required to submit your test at the standard test end time. You will not be allowed entry more than 30 minutes after the test starts. In the absence of an approved extension, you cannot complete this assessment at a later time, and you will receive a mark of zero for the assessment if you have not completed it by the scheduled date and time.

Assessment Due Date

The test is to be written during the timetabled class time in Week 5.

Return Date to Students

Within 3 weeks of submission

Weighting
40%

Assessment Criteria
Question responses will be scored on the following criteria:

- correct use of terminology
- correct selection and application of core concepts to the specific content of the question
- clarity, correctness, relevance and completeness of the response in addressing the question that was asked

The number of marks for each question are allocated based on the depth and breadth of the required response, and will be indicated on the test paper.

Referencing Style

- Harvard (author-date)

Submission
Offline

Learning Outcomes Assessed

- Perform radiographic imaging in a safe and technically correct manner in a simulated PACS-integrated digital radiographic environment.
- Evaluate the technical aspects of radiographic image appearances.
- Control the technical aspects of radiographic image appearances.

Graduate Attributes

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

2 In-class Test 2

Assessment Type
In-class Test(s)

Task Description
You will write an in-class test to demonstrate your ability to apply the concepts and use the terminology from all weeks of study, with emphasis on Weeks 6 - 11 of the unit. All questions will be based on the posted weekly learning goals. Question tasks will be of a similar type to those practiced in weekly tutorials. These tasks may include analysis of projected diagrams, photographs and/or radiographs, creation of line diagrams to illustrate concepts, explanations and discussions.

This test is a closed-book assessment of 105 minutes duration. You will have a ten minute perusal time prior to the allotted writing time. You will write the test under examination conditions as detailed in the Assessment Procedures. You will submit your test paper and rough paper at the end of the test period.

This test must be written at the timetabled date and time. As per the Assessment Procedures, this task is to be completed during a defined period. There is no opportunity to apply a late penalty. If you arrive late, you may enter the test room up to 30 minutes after the start of the test; however, you will still be required to submit your test at the standard test end time. You will not be allowed entry more than 30 minutes after the test starts. In the absence of an approved extension, you cannot complete this assessment at a later time, and you will receive a mark of zero for the assessment if you have not completed it by the scheduled date and time.

Assessment Due Date

The test is to be written during the timetabled class time in Week 13.

Return Date to Students

Results will be released at certification of grades for the term.

Weighting
60%

Minimum mark or grade
50%

Assessment Criteria
Question responses will be scored on the following criteria:

- correct use of terminology
- correct selection and application of core concepts to the specific content of the question
- clarity, correctness, relevance and completeness of the response in addressing the question that was asked

The number of marks for each question are allocated based on the depth and breadth of the required response, and will be indicated on the test paper.

Referencing Style

- Harvard (author-date)

Submission
Offline

Learning Outcomes Assessed

- Perform radiographic imaging in a safe and technically correct manner in a simulated PACS-integrated digital radiographic environment.
- Outline the construction and operation of various digital radiographic image receptors and processing systems.
- Detail the processes of image acquisition, processing and display for digital radiography.
- Evaluate the technical aspects of radiographic image appearances.
- Control the technical aspects of radiographic image appearances.

Graduate Attributes

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

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