MEDI12002 *Science and Instrumentation 1*
Term 1 - 2020

Profile information current as at 27/04/2024 03:57 am

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.

Corrections

Unit Profile Correction added on 17-04-20

Assessment 1 - In-class Test - changed to online test. Please see your Moodle site for further details.
Assessment 2 - Examination - changed to online test. Please see your Moodle site for further details.

General Information

Overview

This unit focuses on the the main steps in producing a useful digital radiograph. You will learn to control of the x-ray beam's production and passage through the structures by judicious selection of technical factors. You will learn to control scatter radiation and recognise its impact on radiographs. You will harness image geometry concepts to control structural appearances on radiographs. You will explore basic concepts of digital imaging technology with a focus on clinical skill in the production, display, manipulation, storage and distribution of digital radiographs. You will become familiar with the attributes of radiographic image quality and the many factors that impact on those attributes.

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 MEDI11002 Physics for Health Sciences ESSC11004 Study and Research Skills for Health Sciences 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 - 2020

- 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. **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 Unit coordinator and student feedback.

Feedback
Weekly quizzes, labs and tutorials were all helpful for learning and understanding the content.

Recommendation
Continue with the existing format of lectures, labs and tutorials. Continue to use weekly formative revision quizzes.

Feedback from Self-reflection and student feedback.

Feedback
Marking, feedback and return of the first in-class test supported student learning.

Recommendation
Continue to provide informative marking on the first in-class test and return to students in a timely manner.

Feedback from Medical Imaging Team

Feedback
For a unit that runs prior to the first clinical placement, there could be more focus on technical factor selection and adjustment and less content on digital technologies.

Recommendation
Reassess distribution of content across MEDI12002 Science & Instrumentation 1 and MEDI12005 Science & Instrumentation 2.

Unit Learning Outcomes

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

1. Use technical terminology correctly in describing radiographic image appearances
2. Apply concepts of image geometry, differential attenuation, scatter production and equipment operation to control radiographic image appearances
3. Make reasoned adjustments to technical factor selections according to the attenuating properties of the structures being imaged and the requirements of the imaging system
4. Discuss at a basic level the clinical operation of the various digital radiographic image receptors and processing systems
5. Discuss at a basic level core concepts of digital image properties, display, manipulation and storage.

This unit links to the following Professional Capabilities for Medical Radiation Practitioners as detailed by the Medical Radiation Practice Board of Australia (effective March 2020):

- *Domain 1:2 Use clinical information management systems appropriately (parts a-g).*
- *Domain 1:6 Implement techniques for patient/client stabilisation and reproducibility of procedures and outcomes (part a).*
- *Domain 1A:1 Perform projection radiography in a range of setting (parts a,c,d,f)*

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 - Examination - 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 - Examination - 60%	•	•				•				

Textbooks and Resources

Textbooks

MEDI12002

Prescribed

Essentials of Radiographic Physics & Imaging
Edition: 3 (2019)
Authors: James Johnston and Terri Fauber
Elsevier
St. Louis , Missouri , USA
ISBN: 9780323566681
Binding: Hardcover

Additional Textbook Information
This textbook is required for multiple second year units: MEDI12002 Science & Instrumentation 1, MEDI12005 Science & Instrumentation 2 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.

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 - 09 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Radiographic 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 • introduction to the digital image	Prescribed text, sections from: • Chapter 8 • Chapter 9 Refer to Moodle for specific pages and any additional readings	Lab & tutorial: • orientation to the radiographic laboratory and PACS • image properties

Week 2 - 16 Mar 2020

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)	Prescribed text, sections from: • Chapter 9 • Chapter 11 Refer to Moodle for specific pages and any additional readings	Lab & tutorial - geometric distortion

Week 3 - 23 Mar 2020

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 • unsharpness and visibility • absorption blur, motion blur • spatial resolution	Prescribed text, sections from: • Chapter 5 • Chapter 11 Refer to Moodle for specific pages and any additional readings	Lab & tutorial - unsharpness and spatial resolution

Week 4 - 30 Mar 2020

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 • effect of scatter on visibility • contrast resolution	Prescribed text, sections from: • Chapter 8 • Chapter 12 Refer to Moodle for specific pages and any additional readings	Lab & tutorial - scatter on images

Week 5 - 06 Apr 2020

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, sections from Chapter 12 Refer to Moodle for specific pages and any additional readings	Lab - grid use No tutorial

Vacation Week - 13 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Break week		

Week 6 - 20 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Assessment week - no new content		No lab **Tutorial on Wednesday** will address Week 5 content **In-class Test 1: Thursday 23 April**

Week 7 - 27 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic

Digital radiographic imaging • properties of the digital radiograph • digital vs film-screen imaging • digital radiography process of acquisition, processing and display • visibility of displayed image • PACS systems and PACS workflow • DICOM	Prescribed text, sections from: • Chapter 8 • Chapter 9 • Chapter 10 Refer to Moodle for specific pages and any additional readings	Lab & tutorial - digital radiographic imaging

Week 8 - 04 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Digital radiographic image receptor systems • computed radiography • image reader • direct read radiography	Prescribed text from Chapter 10 Refer to Moodle for specific pages and any additional readings	Lab & tutorial - digital image acquisition

Week 9 - 11 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Radiographic exposure technique (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	Prescribed text, sections from Chapters 10 and 11 Refer to Moodle for specific pages and any additional readings	Lab & tutorial - effects of mAs and kV change

Week 10 - 18 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Radiographic exposure technique (2) • SID changes and direct square law • anode heel effect • basics of automatic exposure control • anatomical programming • control of tube heating	Prescribed text, sections from: • Chapter 5 • Chapter 11 • Chapter 13 Refer to Moodle for specific pages and any additional readings	Lab & tutorial - other determinants of beam quality and quantity

Week 11 - 25 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Selection of exposure factors • impact of body part content and size • exponential attenuation • exposure technique charts	Prescribed text, sections from Chapters 11 and 13 Refer to Moodle for specific pages and any additional readings	Lab & tutorial - adjustment of exposure factors

Week 12 - 01 Jun 2020

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

Review/Exam Week - 08 Jun 2020

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 15 Jun 2020

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, readings and other Moodle resources - 2-3 hours

You will also need to spend time in revision and preparation for the in-class test and 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. Tutorials are also closely related to the lab for the week. Your regular and active participation in both labs and tutorials strongly supports your success in the unit.

Assessment Tasks

1 In-Class Test

Assessment Type
In-class Test(s)

Task Description
You will write an in-class test in Week 6 to demonstrate your ability to apply the concepts and use the terminology from Weeks 1 - 5 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 definitions, 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 90 minutes duration. You will have ten 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 'Practical' class in Week 6.

Return Date to Students
Week 9 Monday (11 May 2020)

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

- Use technical terminology correctly in describing radiographic image appearances
- Apply concepts of image geometry, differential attenuation, scatter production and equipment operation to control radiographic image appearances

Graduate Attributes

- Communication
- Problem Solving

Examination

Outline
Complete an invigilated examination.

Date
During the examination period at a CQUniversity examination centre.

Weighting
60%

Length
180 minutes

Minimum mark or grade
50%

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