



MEDI12002 *Science and Instrumentation 1*

Term 1 - 2021

Profile information current as at 19/08/2022 06:52 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 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 - 2021

- 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. **Online Test**

Weighting: 40%

2. **Online Test**

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 feedback, unit coordinator reflection, course staff.

Feedback

Recorded lectures provide students with flexibility in study times and the ability to re-watch or pause to support learning.

Recommendation

Use a flipped-classroom model with all recorded lectures and face-to-face labs and tutorials.

Feedback from Student feedback.

Feedback

Revision quizzes with feedback were helpful.

Recommendation

Continue with the use of the revision quizzes and include feedback to responses.

Feedback from Unit coordinator reflection

Feedback

The online quiz for the first assessment supports feedback and more timely return to students.

Recommendation

Investigate using an online Moodle quiz as the first assessment.

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



Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
1 - Online Test - 40%	•	•			
2 - Online Test - 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 - Online Test - 40%	•	•								
2 - Online Test - 60%	•	•				•				

Textbooks and Resources

Textbooks

MEDI12002

Prescribed

Essentials of Radiographic Physics & Imaging

Edition: 3 (2020)

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 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 US Vital Source online store

<https://www.vitalsource.com/products/essentials-of-radiographic-physics-and-imaging-james-johnston-terri-l-v9780323594486>

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 - 08 Mar 2021

Module/Topic	Chapter	Events and Submissions/Topic
Radiographic image properties and the imaging process <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• Chapter 8• Chapter 9 Refer to Moodle for specific pages and any additional readings	Lab & tutorial: <ul style="list-style-type: none">• orientation to the radiographic laboratory and PACS• image properties

Week 2 - 15 Mar 2021

Module/Topic	Chapter	Events and Submissions/Topic
Image Geometry - distortion <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Chapter 9 • Chapter 11 Refer to Moodle for specific pages and any additional readings	Lab & tutorial - geometric distortion

Week 3 - 22 Mar 2021

Module/Topic	Chapter	Events and Submissions/Topic
Image Geometry - unsharpness <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Chapter 5 • Chapter 11 Refer to Moodle for specific pages and any additional readings	Lab & tutorial - unsharpness and spatial resolution

Week 4 - 29 Mar 2021

Module/Topic	Chapter	Events and Submissions/Topic
Scatter on the radiographic image <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Chapter 8 • Chapter 12 Refer to Moodle for specific pages and any additional readings	Lab & tutorial - scatter on images

Week 5 - 05 Apr 2021

Module/Topic	Chapter	Events and Submissions/Topic
Control of scatter using grids <ul style="list-style-type: none"> • 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 & tutorial - grid use

Vacation Week - 12 Apr 2021

Module/Topic	Chapter	Events and Submissions/Topic
Break week		

Week 6 - 19 Apr 2021

Module/Topic	Chapter	Events and Submissions/Topic
Assessment week - no new content		Online Test 1: Wednesday 21 April 2021. Begins 2pm AEST. Ends 3:30pm AEST. No lab or tutorial

Week 7 - 26 Apr 2021

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

Lab & tutorial - digital radiographic imaging

Refer to Moodle for specific pages and any additional readings

Week 8 - 03 May 2021**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 - 10 May 2021**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 - 17 May 2021**Module/Topic****Chapter****Events and Submissions/Topic****Radiographic exposure technique (2)**

- control of tube heating
- basics of automatic exposure control
- exposure technique charts and anatomical programming
- SID changes and direct square law

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 - 24 May 2021**Module/Topic****Chapter****Events and Submissions/Topic****Selection of exposure factors**

- impact of body part content and size
- exponential attenuation
- formulation of an exposure technique chart
- circumstances requiring exposure technique modification

Prescribed text, sections from Chapters 11 and 13

Refer to Moodle for specific pages and any additional readings

Lab & tutorial - exposure technique chart formulation

Week 12 - 31 May 2021**Module/Topic****Chapter****Events and Submissions/Topic**

Revision/Consolidation

No lab
Revision tutorial

Review/Exam Week - 07 Jun 2021**Module/Topic****Chapter****Events and Submissions/Topic****Exam Week - 14 Jun 2021****Module/Topic****Chapter****Events and Submissions/Topic**

Online Test 2: Date & time to be advised.

Term Specific Information

This unit is designed to be taken concurrently with MEDI12001 Radiation Science and content from that unit will be referred to and used to develop understanding of the content in this unit. You are expected to spend on average 10 - 12 hours of time each week in your study activities for this unit.

A suggested time budget for weekly study is:

- Assigned reading - 1-2 hours
- Watching and taking notes from recorded lectures - 2 hours
- Labs (preparation, lab time, group time) - 2 hours
- Tutorial preparation and participation - 2.5 hours
- Creating your own study notes to meet weekly learning goals using lectures, tutorials, readings and other Moodle resources - 2-3 hours
- You will also need to spend time throughout term in revision and preparation for the in-class tests

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 Online Test 1

Assessment Type

Online Test

Task Description

You will complete an online 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 and will require you to apply your knowledge and understanding to a given scenario. The tasks may include analysis of diagrams, photographs and/or radiographs. Questions may include quiz-style questions (for example multiple choice, fill-in-the-blank, matching), true/false with explanation and written response.

This is an open-book test. It means that during the test you may access your study notes, textbook, the unit Moodle site and/or any website. **The standards of academic integrity still apply.** All responses must be your own work. Colluding with other students on non-group work is considered academic misconduct. Just as for written assignments, you must also acknowledge intellectual content in your answers that is not your own work. Basic statements of facts are considered 'common knowledge' in the context of this unit so they do not need to be cited. However, *if you copy any explanation content word-for-word from ANY source, you must put that content in quotation marks and formally cite your source.* Although this is an open-book test, the expectation is that you will be familiar with the unit content and concepts. You should not assume you will have time to look up the answer to every question.

This is a timed online test via Moodle and will be for a 90 minute duration. This test must be completed at the timetabled date and time. There is no opportunity to apply a late penalty. 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 submitted it by the scheduled date and time. If you start the test late, you will still be required to submit at the stated closing time.

Assessment Due Date

This test is to be completed on Wednesday 21 April 2021 beginning at 2pm AEST and will be for a duration of 90 minutes, closing at 3:30pm AEST.

Return Date to Students

Week 8 Wednesday (5 May 2021)

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 online test.

Referencing Style

- [Harvard \(author-date\)](#)

Submission

Online

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

2 Online Test 2

Assessment Type

Online Test

Task Description

You will complete an online test in Week 14 to demonstrate your ability to apply the concepts and use the terminology learned in 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 and will require you to apply your knowledge and understanding to a given scenario. The tasks may include analysis of diagrams, photographs and/or radiographs. Questions may include quiz-style questions (for example multiple choice, fill-in-the-blank, matching), true/false with explanation and written response.

This is an open-book test. It means that during the test you may access your study notes, textbook, the unit Moodle site and/or any website. **The standards of academic integrity still apply.** All responses must be your own work. Colluding with other students on non-group work is considered academic misconduct. Just as for written assignments, you must also acknowledge intellectual content in your answers that is not your own work. Basic statements of facts are considered 'common knowledge' in the context of this unit so they do not need to be cited. However, *if you copy any explanation content word-for-word from ANY source, you must put that content in quotation marks and formally cite your source.* Although this is an open-book test, the expectation is that you will be familiar with the unit content and concepts. You should not assume you will have time to look up the answer to every question. The test will be for a duration of 150 minutes.

This is a timed online test via Moodle and must be completed at the timetabled date and time. There is no opportunity to apply a late penalty. 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 submitted it by the scheduled date and time. If you start the test late, you will still be required to submit at the stated closing time.

Assessment Due Date

This test will be administered during the University's Exam period. The time and date of the test will be advised via Moodle.

Return Date to Students

At certification of grade.

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 online test.

Referencing Style

- [Harvard \(author-date\)](#)

Submission

Online

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
- Make reasoned adjustments to technical factor selections according to the attenuating properties of the structures being imaged and the requirements of the imaging system
- Discuss at a basic level the clinical operation of the various digital radiographic image receptors and processing systems
- Discuss at a basic level core concepts of digital image properties, display, manipulation and storage.

Graduate Attributes

- Communication
- Problem Solving
- 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