MEDI12001 *Radiation Science*
Term 1 - 2020

Profile information current as at 14/12/2025 04:09 pm

Corrections

Unit Profile Correction added on 30-03-20

The In-class Test has now been changed to an alternate form of assessment. Further details about this assessment will be made available on the unit Moodle site in due course.
The end of term examination has now been changed to an alternate form of assessment. Further details about the assessment will be made available on Moodle in due course.

General Information

Overview

This unit prepares you for the safe and effective use of ionising radiation for radiographic imaging in the simulated and clinical environment. The unit covers production and control of the radiation beam, radiation interactions in matter and risk of detriment to the human body from exposure to radiation. Radiation safety and dose minimisation practices are examined in light of current findings on detriment from low level radiation.

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 the Imaging Professions MEDI11002 Physics for Health Science ESSC11004 Study and Research Skills for Health Sciences
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 Have your say Student evaluation Unit coordinator self-reflection

Feedback

Delivery format is working well and is suiting student learning styles.

Recommendation

Maintain the unit delivery of lecture followed by tutorial few days later to consolidate the content. Pre-recorded portion was effective in supporting the delivery of the content in the unit.

Feedback from Have your say Student evaluation

Feedback

Some students have suggested for the face-to-face lecture session to be recorded to support them in note taking and revision later on.

Recommendation

Investigate the option of offering recordings of face-to-face lecture sessions in future deliveries.

Unit Learning Outcomes

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

1. Discuss the design, structure and operation of the x-ray tube in the production of x-radiation
2. Discuss the use of technical parameters, filters and collimation to control the useful x-ray beam's contents and dimensions
3. Apply underlying physical concepts in discussing the processes of x-ray photon production, x-ray interactions with matter and differential attenuation, in explaining the factors that affect each and in explaining the various metrics of radiation quantity and risk
4. Discuss current scientific understanding of the bioeffects and associated risks of radiation at the levels used in diagnostic radiology to body cells, tissues and systems across the lifespan
5. Discuss radiation safety regulations and legislation and associated best practice standards as they apply to occupational exposure and safe use of ionising radiation in diagnostic imaging.

This unit links to the following Professional Capabilities for Medical Radiation Practitioners as detailed by the Medical Radiation Practice Board of Australia (effective 1 March 2020):

- Domain 1A:1 Perform projection radiography examinations in a range of settings (parts a,d)
- Domain 5:1 Perform and provide safe radiation practice (parts a,b,c,d,f)
- Domain 5:4 Maintain safety of the workplace and associated environments (a,c,d,e,f,g)

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 - 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

MEDI12001

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: MEDI12001 Radiation Science, MEDI12002 Science & Instrumentation 1 and MEDI12005 Science & Instrumentation 2. 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.

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: Harvard (author-date)
For further information, see the Assessment Tasks.

Teaching Contacts

Reshmi Kumar Unit Coordinator
r.d.kumar@cqu.edu.au

Schedule

Week 1 - 09 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
X-ray production • Review of Physics foundation concepts associated with x-ray production • Overview of key internal and external structures (anode and cathode) of the x-ray tube involved in the x-ray production process • Heat production at the anode • Characteristic radiation production • Bremsstrahlung radiation process	Essentials of Radiographic Physics & Imaging 3rd edn Chapter 4, Chapter 5 & Chapter 6 • Refer to Moodle for specific pages and any additional readings	

Week 2 - 16 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
X-ray spectrum Expression of radiation quantity • Exposure, exposure rate, radioactivity, KERMA, entrance surface dose, dose area product, absorbed dose, equivalent dose, effective dose and tissue weighting X-ray emission spectrum • Impact of exposure time, mAs and kVp on beam spectrum	Essentials of Radiographic Physics & Imaging 3rd edn Chapter 6 • Refer to Moodle for specific pages and any additional readings	

Week 3 - 23 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Interaction of x-rays with matter • Compton scattering • Photoelectric effect • Factors affecting probability of interactions of x-ray with matter	Essentials of Radiographic Physics & Imaging 3rd edn Chapter 7 • Refer to Moodle for specific pages and any additional readings	

Week 4 - 30 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
X-ray beam attenuation • Exponential attenuation • Anode heel effect (self-filtration) • HVL and compensating filters • Impact of filtration on beam spectrum	Essentials of Radiographic physics 3rd edn Chapter 6 • Refer to Moodle for specific pages and any additional readings	

Week 5 - 06 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Assessment week	No new content taught	**In-Class Test**

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
Radiosensitivity and radiation risk • Radiosensitivity classification of cell and tissue type • Physical and biological factors affecting radiation response • Stochastic versus deterministic effects • radiation dose-response relationships • Epidemiological studies to assess risk of radiation detriment • Risk models	Refer to the unit Moodle site for assigned readings	

Week 7 - 27 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Hereditary effects of radiation • Review of meiosis and gamete production • Radiation effect on different developmental stages of pregnancy • Target theory • Models of cell survival • Cell recovery	Refer to the unit Moodle site for assigned readings	

Week 8 - 04 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Radiation effects at cellular level, on the body systems and the body • Review of mitosis process • In-vitro irradiation of macromolecules (main-chain scission, cross-linking and point lesions) • Effects of radiation on DNA • Radiolysis of water • Direct and indirect effects of radiation	Refer to the unit Moodle site for assigned readings	

Week 9 - 11 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Radiation protection • Cardinal principles of radiation protection • ALARA principle • Leakage radiation • Radiographic features in modern x-ray imaging systems • Design of primary and secondary radiation barriers	Refer to the unit Moodle site for assigned readings	

Week 10 - 18 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Radiation dose management - Part 1 • Radiation detection and management • Occupational versus public radiation exposure • Managing occupational exposure	Refer to the unit Moodle site for assigned readings	

Week 11 - 25 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Radiation dose management - Part 2 • Reducing unnecessary patient dose • Pregnant patients	Refer to the unit Moodle site for assigned readings	

Week 12 - 01 Jun 2020

Module/Topic	Chapter	Events and Submissions/Topic
Consolidation and revision		

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

Each week normally includes one hour of lecture and a tutorial. You are expected to spend on average 10 -12 hours of time each week in your study activities for this unit. A suggested budget for weekly study is:

- 2 hours for attending lectures, watching lecture recordings and taking notes
- 1.5 - 2 hours for completing assigned readings
- 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
- 1-1.5 hours for working on posted tutorial questions in preparation for tutorial
- 1 hour for participation in tutorial
- 1-2 hours for preparation and/or revision for 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 response to test questions. Your regular and active participation strongly supports your success in the unit.

Assessment Tasks

1 In-Class test

Assessment Type
In-class Test(s)

Task Description

You will complete an In-class test in Week 5 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 the same types that you will practice in weekly tutorials. These tasks may include analysis of projected diagrams, photographs and/or radiographs, creation of line diagrams to illustrate concepts, explanation and discussions.

This test is a closed-book assessment of 90 minutes duration and will be in written format. You will have a ten minute perusal time prior to the allocated writing time. You will write the test under examination conditions as detailed in the Assessment Procedures. You will submit your test 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 for 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 designated timetabled session in Week 5.

Return Date to Students
Week 7 Thursday (30 Apr 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 breath of the required response, and will be indicated on the test paper.

Referencing Style

- Harvard (author-date)

Submission
Offline

Learning Outcomes Assessed

- Discuss the design, structure and operation of the x-ray tube in the production of x-radiation
- Discuss the use of technical parameters, filters and collimation to control the useful x-ray beam's contents and dimensions
- Apply underlying physical concepts in discussing the processes of x-ray photon production, x-ray interactions with matter and differential attenuation, in explaining the factors that affect each and in explaining the various metrics of radiation quantity and risk

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