MEDI12001 *Radiation Science*
Term 1 - 2018

Profile information current as at 14/12/2025 03:42 pm

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; and MEDI11002 Physics for Health Science; and ESSC11004 Study and Research Skills for Health Sciences (replacing SCIE11023)
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

- 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 Have your say Unit Coordinator reflection

Feedback

Due to public holidays and coordinator traveling for other uni business, there was no face-to-face lectures in 5 weeks out of the 12. There were video recordings provided instead.

Recommendation

If the scheduled lecture falls on a public holiday and if the unit coordinator is required to be away from campus for other uni business, this needs to be factored into timetabling.

Feedback from Have your say Unit Coordinator reflection

Feedback

Some students felt that assessment feedback was not provided in a timely manner although a global feedback was provided within one week of the assessment date.

Recommendation

Review the time-frame stipulated in the unit profile for feedback. It may be beneficial to specify that a global feedback will be provided two weeks after the assessment date and individual feedback three weeks later. This approach will ensure that timely feedback is provided.

Feedback from Have your say Unit Coordinator reflection

Feedback

The weekly learning goals helped students to focus their reading and independent study.

Recommendation

Maintain the use of weekly learning goals as they help students focus on key concepts.

Unit Learning Outcomes

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

1. Outline the design, structure and operation of the x-ray tube in the production of x-radiation.
2. Discuss the use of devices and technical parameters to control the production, filtration and emission of the x-ray beam.
3. Apply knowledge of x-ray interactive processes, probabilities of interactions and exponential attenuation concepts to the control of absorption and scatter in radiographic imaging and radiation protection.
4. Discuss the long and short term effects of ionising radiation on the human body, embryo and foetus.
5. Apply the ALARA principle to the operation of x-ray equipment and the practice of radiography.

Medical Radiation Practice Board of Australia Professional Capabilities for Medical Radiation Practice:
Domain 4: 1. Implement safe radiation practice appropriate to their division of registration. 2. Confirm and operate equipment safely and appropriate to their division of registration. 3. Maintain safety of self and others in the work environment appropriate to their division of registration. 4. Safely manage radiation and radioactivity in the environment.
Domain 5: 2. Apply principles of medical radiation physics and instrumentation.

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 - 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

MEDI12001

Prescribed

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

Additional Textbook Information
Students enrolled in the unit will also be using the prescribed textbook in the three Science and Instrumentation units taught in the course. 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 at http://bookshop.cqu.edu.au/texts.asp. The e-book version of this text can be purchased at the publisher's Vital Source online store using the eText ISBN: 9780323339711.

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 - 05 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
X-ray tube construction and operation • Review of Physics foundation concepts associated with medical imaging • Internal and external structure of the x-ray tube • Contribution of the internal structures towards x-ray tube operation	**Essentials of Radiographic Physics & Imaging 2nd edn** • Chapter 4 (pages 45-47) • Chapter 5 **Radiologic Science for Technologists Physics, Biology and Protection 10th edn** (online access - CQU Library • Chapters 1, 3, 4 & 6	

Week 2 - 12 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
X-ray production • Heat production at anode • Characteristic radiation process • Bremsstrahlung radiation process	**Essentials of Radiographic Physics & Imaging 2nd edn** • Chapter 6 **Radiologic Science for Technologists Physics, Biology and Protection 10th edn** (online access - CQU Library) • Chapters 6 (pages 116-118) & 7	

Week 3 - 19 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
X-ray spectrum • Expressions of radiation quantity (Exposure, exposure rate, radioactivity, KERMA, entrance surface dose, dose area product, absorbed dose, equivalent dose, effective dose, tissue weighting) • X-ray emission spectrum • Impact of exposure time, mAs and kVp on beam spectrum	**Essentials of Radiographic Physics & Imaging 2nd edn** • Chapter 6 **Radiologic Science for Technologists Physics, Biology and Protection 10th edn** (online access - CQU Library) • Chapters 7 (pages 128 -132) & 8	

Week 4 - 26 Mar 2018

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 2nd edn** • Chapter 7 **Radiologic Science for Technologists Physics, Biology and Protection 10th edn** (online access - CQU Library) • Chapter 9 (pages 148-151)	

Week 5 - 02 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
X-ray beam attenuation • Exponential attenuation • Added and inherent filtration • HVL • Impact of filtration on beam spectrum	**Essentials of Radiographic Physics & Imaging 2nd edn** • Chapter 6 **Radiologic Science for Technologists Physics, Biology and Protection 10th edn** (online access - CQU Library) • Chapters 7 (page 132), 8 & 9 (pages 154-159)	

Vacation Week - 09 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Break		

Week 6 - 16 Apr 2018

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	**Radiologic Science for Technologists Physics, Biology and Protection 10th edn** (online access - CQU Library) • Chapters 30, 33 & 34	

Week 7 - 23 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Assessment Week - No new content		In-class Test 1

Week 8 - 30 Apr 2018

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	**Radiologic Science for Technologists Physics, Biology and Protection 10th edn** (online access - CQU Library) • Chapters 29, 32 & 34 (pages 530-536)	

Week 9 - 07 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
Radiation effects at the 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	**Radiologic Science for Technologists Physics, Biology and Protection 10th edn** (online access - CQU Library) • Chapters 29 (pages 472- 477) & 31	

Week 10 - 14 May 2018

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	**Radiologic Science for Technologists Physics, Biology and Protection 10th edn** (online access - CQU Library) Chapters 35 (pages 539-543) & 36 (pages 549-556)	

Week 11 - 21 May 2018

Module/Topic	Chapter	Events and Submissions/Topic

Radiation dose management • Radiation detection and management • Occupational versus public radiation exposure • Managing occupational exposure • Reducing unnecessary patient radiation dose • Pregnant patients	**Radiologic Science for Technologists Physics, Biology and Protection 10th edn** (online access - CQU Library) Chapters 36 (pages 556-564), 37 & 38	

Week 12 - 28 May 2018

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

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
		In-class Test 2

Term Specific Information

This unit is designed to be taken concurrently with MEDI12002 Science and Instrumentation 1 and MEDI12003 Imaging Procedures 1. Content from both of those units will be referred to and applied in this unit in both learning activities and assessments. Each week normally includes two hours of lectures and a tutorial. 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 hours for lectures and taking notes
- 1.5 - 2 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
- 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 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
This in-class test will be held in **Week 7** and you will write the in-class test 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 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, explanations and discussions.
This test is a closed-book assessment of 90 minutes duration and will be delivered at computer workstations so that you may view both text and visuals. You may choose to provide your test responses either in traditional pen-and-paper format or electronically at the workstation. You will have a five minute perusal time prior to the allotted writing time. 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 designated timetabled session in Week 7.

Return Date to Students

General feedback will be provided within 2 weeks. Individualised feedback will be provided within 3 weeks.

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 Online

Submission Instructions
Students can submit either the online version or the hardcopy version of the test.

Learning Outcomes Assessed

- Outline the design, structure and operation of the x-ray tube in the production of x-radiation.
- Discuss the use of devices and technical parameters to control the production, filtration and emission of the x-ray beam.
- Apply knowledge of x-ray interactive processes, probabilities of interactions and exponential attenuation concepts to the control of absorption and scatter in radiographic imaging and radiation protection.

Graduate Attributes

- Communication
- Problem Solving
- Information Literacy

2 In-class Test 2

Assessment Type
In-class Test(s)

Task Description
This in-class test will be held in **Week 14** and you will write the 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 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, explanations and discussions.
This test is a closed-book assessment of 90 minutes duration and will be delivered at computer workstations so that you may view both text and visuals. You may choose to provide your test responses either in traditional pen-and-paper format or electronically at the workstation. You will have a five minute perusal time prior to the allotted writing time.
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 designated timetabled session in Week 14.

Return Date to Students

Two weeks after the test due date.

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 Online

Learning Outcomes Assessed

- Outline the design, structure and operation of the x-ray tube in the production of x-radiation.
- Discuss the use of devices and technical parameters to control the production, filtration and emission of the x-ray beam.
- Apply knowledge of x-ray interactive processes, probabilities of interactions and exponential attenuation concepts to the control of absorption and scatter in radiographic imaging and radiation protection.
- Discuss the long and short term effects of ionising radiation on the human body, embryo and foetus.
- Apply the ALARA principle to the operation of x-ray equipment and the practice of radiography.

Graduate Attributes

- Communication
- Problem Solving
- Information Literacy
- Ethical practice

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