MEDI12001 *Radiation Science*
Term 1 - 2017

Profile information current as at 29/04/2024 05:41 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 - 2017

- 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 Coordinator self-reflection Have your say evaluation

Feedback
Use of concept maps to aid in learning.

Recommendation
Concept maps were used during consolidation week and worked well as a revision tool. Include more concept maps during tutorials to help enhance students' understanding of key content covered in the course.

Action
Concept maps were used frequently during tutorials.

Feedback from Coordinator self-reflection Have your say evaluation

Feedback
Use of study guides for tutorials.

Recommendation
Provide study guides as a self-study tool for students to test their understanding of the course content. Include more interactive activities for tutorial sessions.

Action
Instead of study guide questions, interactive activities including scenario-based questions were adapted for the tutorials.

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

— 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

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

Radiologic Science for Technologists: Physics, Biology, and Protection
Edition: 11th (2014)
Authors: Stewart C. Bushong
Elsevier
Philadelphia , PA , USA
ISBN: 9780323353779
Binding: Hardcover
MEDI12001

Prescribed

The Essential Physics of Medical Imaging
Edition: 3rd (2014)
Authors: Jerrold T. Bushberg Et Al
Lippincott Williams and Wilkins
Philadelphia , PA , USA
ISBN: 9781469871738
Binding: Hardcover

Additional Textbook Information
Students taking this course will be using the two textbooks for the course MEDI12002: Science & Instrumentation 1 as well.Students may use either the hardcopy (ISBN 9780781780575) or e-book version (ISBN 9781469871738) of The Essential Physics of Medical Imaging text.

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 - 06 Mar 2017

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	Recommended readings available on the unit Moodle site	Lab 1

Week 2 - 13 Mar 2017

Module/Topic	Chapter	Events and Submissions/Topic
X-ray production • Heat production at anode • Characteristic radiation process • Bremsstrahlung radiation process	Recommended readings available on the unit Moodle site	Lab 2

Week 3 - 20 Mar 2017

Module/Topic	Chapter	Events and Submissions/Topic
X-ray spectrum • X-ray emission spectrum • Impact of exposure time, mAs and kVp on beam spectrum	Recommended readings available on the unit Moodle site	Lab 3

Week 4 - 27 Mar 2017

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	Recommended readings available on the unit Moodle site	Lab 4

Week 5 - 03 Apr 2017

Module/Topic	Chapter	Events and Submissions/Topic
X-ray beam attenuation • Exponential attenuation • Added and inherent filtration • HVL • Impact of filtration on beam spectrum	Recommended readings available on the unit Moodle site	Lab 5

Vacation Week - 10 Apr 2017

Module/Topic	Chapter	Events and Submissions/Topic
Break		

Week 6 - 17 Apr 2017

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	Recommended readings available on the unit Moodle site	

Week 7 - 24 Apr 2017

Module/Topic	Chapter	Events and Submissions/Topic

Hereditary effects of radiation • Review of meiosis and gamete production • Radiation effect on different developmental stages of pregancy • Target theory • Models of cell survival • Cell recovery	Recommended readings available on the unit Moodle site	**In-class Test 1** Due: Week 7 Monday (24 Apr 2017) 11:00 am AEST

Week 8 - 01 May 2017

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	Recommended readings available on the unit Moodle site	

Week 9 - 08 May 2017

Module/Topic	Chapter	Events and Submissions/Topic
Expressions of radiation quantity • Radiation regulations and governing bodies • SI and/or tradition units of measure (Exposure, exposure rate, radioactivity, KERMA, entrance surface dose, dose area product, absorbed dose, equivalent dose, effective dose, tissue weighting factor)	Recommended readings available on the unit Moodle site	

Week 10 - 15 May 2017

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	Recommended readings available on the unit Moodle site	

Week 11 - 22 May 2017

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	Recommended readings available on the unit Moodle site	

Week 12 - 29 May 2017

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

Review/Exam Week - 05 Jun 2017

Module/Topic	Chapter	Events and Submissions/Topic

		In-class Test 2 Due: Review/Exam Week Monday (5 June 2017) 11:00 am AEST
Exam Week - 12 Jun 2017		
Module/Topic	**Chapter**	**Events and Submissions/Topic**

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. There are practical lab sessions from Weeks 1 - 5 inclusive. You will be required to adhere to all occupational health and safety requirements related to the use of the Medical Imaging laboratories, including completion of the mandatory lab induction prior to your first session. You are required to wear your Medical Imaging lab/clinical shirt for all practical lab sessions.

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. You will have a five minute perusal time prior to the allotted writing time. You will write the test under examinations 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
Week 7 Monday (24 Apr 2017) 11:00 am AEST

Return Date to Students
Monday (8 May 2017)

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

- 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 13 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. You will have a five minute perusal time prior to the allotted writing time. You will write the test under examinations 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
Review/Exam Week Monday (5 June 2017) 11:00 am AEST
The test is to be written during the timetabled class time.

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

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