MEDI12002 *Science and Instrumentation 1*
Term 1 - 2017

Profile information current as at 19/08/2022 05:35 pm

General Information

Overview
This is the first of three units where knowledge is developed and built on in each subsequent unit, and applied in the clinical environment. You will be introduced to the equipment, instruments and science necessary to produce a digital radiographic image. You will learn about technical factor selection, their impact on the image and the acquisition, manipulation and processing of the final image. All material learnt in this unit is reinforced in a simulated setting. A digital radiological laboratory and imaging workstations linked to PACS will allow for experiential learning.

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, and MEDI11002 Physics for Health Sciences, and ESSC11004 Study and Research Skills for Health Sciences (replacing SCIE11023) 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 - 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 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
The study guide model was continued with the provision of weekly learning goals and suggested resources. Some students were not clear on the functional difference between learning goals and revision questions. Tutorials focused on tying lab results to the theory concepts and on applying the concepts to basic clinical situations. These tutorials supported the attainment of the weekly learning goals.

Feedback from Coordinator self-reflection Have your say evaluation

Feedback
Assessment feedback.

Recommendation
Since students work in small groups to acquire the data for the portfolio assessment, it is recommended to have the final work submitted as a group work instead of individual submission. This will reduce the time spent marking the assessments and enable a more timely feedback to be provided.

Action
The assessment tasks were changed in 2017 to replace the portfolio with a written test.

Feedback from Coordinator self-reflection Have your say evaluation

Feedback
Emphasis on definition of key terminologies to promote consistent usage within the course and in other core courses in the program.

Recommendation
Key terms were discussed during lectures, labs and tutorials but some of the terms were either confused or used interchangeably by students resulting in deviation from the context. Including a glossary list in the course Moodle site will help deal with this issue.

Action
The three unit coordinators for the cluster of Year 2 profession-specific units worked together to ensure consistency in use of terminology. Correct use of terminology continued to be emphasised in lectures and tutorials.

Unit Learning Outcomes

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

1. Perform radiographic imaging in a safe and technically correct manner in a simulated PACS-integrated digital radiographic environment.
2. Outline the construction and operation of various digital radiographic image receptors and processing systems.
3. Detail the processes of image acquisition, processing and display for digital radiography.
4. Evaluate the technical aspects of radiographic image appearances.
5. Control the technical aspects of radiographic image appearances.

This unit supports your ability to meet the following components of the Medical Radiation Practice Board of Australia's Professional Capabilities for Medical Radiation Practice:
Domain 4:
1. Implement safe radiation practice appropriate to their division of registration.
5. Safely manage radiation and radioactivity in the environment.
Domain 5:
2. Apply principles of medical radiation physics and instrumentation.
Domain 5A:
1. Implement and evaluate general radiography examinations for a range of patient/client presentations and complexities.

Alignment of Learning Outcomes, Assessment and Graduate Attributes

— N/A Level | • Introductory Level | • Intermediate Level | • Graduate Level | ◦ Professional Level | ◦ Advanced Level

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
1 - In-class Test(s) - 40%	•			•	•
2 - 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	•	•	•	•	•

Graduate Attributes	Learning Outcomes				
	1	2	3	4	5
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

MEDI12002

Prescribed

Radiologic Science for Technologists: Physics, Biology, and Protection
Edition: 11th (2017)
Authors: Stewart C. Bushong
Elsevier
Philadelphia , PA , USA
ISBN: 9780323353779
Binding: Hardcover
MEDI12002

Prescribed

The Essential Physics of Medical Imaging
Edition: 3rd (2011)
Authors: Jerrold T. Bushberg Et Al
Lippincott Williams and Wilkins
Philadelphia , PA , USA
ISBN: 9780781780575
Binding: Hardcover

Additional Textbook Information
Both textbooks are required for all three of the Science & Instrumentation courses plus MEDI12007 Dose and Image Optimisation and MEDI12001 Radiation Science across Years 2 and 3 of the program. Students should already have purchased these books for MEDI12001.
Students may opt to use either the 10th or the 11th edition of Radiologic Science for Technologists. Students may opt to purchase the e-book version of The Essential Physics of Medical Imaging (ISBN 9781469871738) rather than the hard copy. This is available directly from the publisher's website at http://www.lww.com/product/9781469871738.

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

Caroline Falconi Unit Coordinator
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Schedule

Week 1 - 06 Mar 2017

Module/Topic	Chapter	Events and Submissions/Topic

Image properties and the imaging process • differential attenuation • the radiograph as an attenuation map • image properties (visibility, density, contrast, unsharpness or blur, mottle, noise, signal:noise ratio) • imaging workflow	• Bushberg text Chapter 1 section 1.2	Lab 1 • orientation to the radiographic laboratory and PACS

Week 2 - 13 Mar 2017

Module/Topic	Chapter	Events and Submissions/Topic
Image Geometry - distortion • radiographic image geometry • positioning of the beam, part and image receptor to control radiographic appearances of spatial relationships • effects of image geometry on the image (superimposition, magnification and shape distortion)	• Bushong Chapter 10	Lab 2 • geometric distortion

Week 3 - 20 Mar 2017

Module/Topic	Chapter	Events and Submissions/Topic
Image Geometry - unsharpness • line focus principle • effective vs actual focal spot size • effect of focal spot size • effect of image geometry • impact on unsharpness and visibility • spatial resolution • absorption blur and visibility	• Bushong Chapter 10 • Bushberg Chapter 7 section 7.1	Lab 3 • unsharpness and spatial resolution

Week 4 - 27 Mar 2017

Module/Topic	Chapter	Events and Submissions/Topic
Scatter on the radiographic image • control of scatter production • scatter metrics • collimation and positive beam limitation • control of scatter to the image receptor • air gap technique • effect of scatter on visibility • contrast resolution	• Bushong Chapter 11 • Bushberg Chapter 7	Lab 4 • scatter on images

Week 5 - 03 Apr 2017

Module/Topic	Chapter	Events and Submissions/Topic
Control of scatter using grids • grid construction and types • grid use • grid errors • technical factor compensation • grid metrics	• Bushong Chapter 11 • Bushberg Chapter 7	Lab 5 • grid use

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

[assessment week - no new content]		Lab 6 • effects of mAs change • effects of kV change **In-Class Test 1** Due: Week 6 Wednesday (19 Apr 2017) 9:00 am AEST

Week 7 - 24 Apr 2017

Module/Topic	Chapter	Events and Submissions/Topic
Technical factor selection • control of radiation quantity to the image receptor • exposure index and deviation index • control of differential attenuation • effects on the recorded image • mottle and visibility • impacts of body part content and size	• Bushong Chapter 13, 17 • Bushberg Chapter 7 section 7.6	Lab 7 • effects of structure size and contents • anode heel effect

Week 8 - 01 May 2017

Module/Topic	Chapter	Events and Submissions/Topic
Technical factor selection • SID changes and direct square law • anode heel effect • basics of automatic exposure control • technique chart basics • anatomical programming • tube rating charts and technical factor selection	• Bushong Chapter 13, 17 • Bushberg Chapter 7 section 7.6	Lab 8 • SID change • use of AEC

Week 9 - 08 May 2017

Module/Topic	Chapter	Events and Submissions/Topic
Digital radiography and image receptor systems • properties of digital images • digital radiography process of acquisition, processing and display • computed radiography • direct read radiography	• Bushong Chapters 14 - 17 • Bushberg Chapters 5 & 7	Lab 9 [booked into Monday of Week 10] • digital image acquisition and processing

Week 10 - 15 May 2017

Module/Topic	Chapter	Events and Submissions/Topic
Digital image processing • image histogram • image preprocessing and correction • image processing • impact of protocol selection on image appearances	• Bushong Chapters 14 - 17 • Bushberg Chapters 5 & 7	Lab 10 • protocol selection and image appearances

Week 11 - 22 May 2017

Module/Topic	Chapter	Events and Submissions/Topic
Digital radiographic image display and PACS • display devices • visibility of displayed image • PACS systems and PACS workflow • DICOM standards	• Bushong Chapters 28 - 30 • Bushberg Chapters 5 & 7	Lab 11 • image display and viewing • post-processing

Week 12 - 29 May 2017

Module/Topic	Chapter	Events and Submissions/Topic
Revision/Consolidation		**In-class Test 2** Due: Week 12 Wednesday (31 May 2017) 9:00 am AEST

Review/Exam Week - 05 Jun 2017		
Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 12 Jun 2017		
Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

This unit is designed to be taken concurrently with MEDI12001 Radiation Science and MEDI12003 Imaging Procedures 1. Content from both of those units will be referred to and applied in this unit in both learning activities and assessments. Each week normally includes two hours of lectures, a practical lab session and a tutorial. You will be required to adhere to all occupational health and safety requirements related to 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
You will write an in-class test to demonstrate your ability to apply the concepts and use the terminology from all weeks of study, with 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 6 Wednesday (19 Apr 2017) 9:00 am AEST
The test is to be written during the timetabled class time.

Return Date to Students
Week 8 Friday (5 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

- Perform radiographic imaging in a safe and technically correct manner in a simulated PACS-integrated digital radiographic environment.
- Evaluate the technical aspects of radiographic image appearances.
- Control the technical aspects of radiographic image appearances.

Graduate Attributes

- Communication
- Problem Solving
- Information Literacy
- Information Technology Competence

2 In-class Test 2

Assessment Type
In-class Test(s)

Task Description
You will write an 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
Week 12 Wednesday (31 May 2017) 9:00 am AEST
The test is to be written during the timetabled class time.

Return Date to Students
Exam Week Friday (16 June 2017)

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

- Perform radiographic imaging in a safe and technically correct manner in a simulated PACS-integrated digital radiographic environment.
- Outline the construction and operation of various digital radiographic image receptors and processing systems.
- Detail the processes of image acquisition, processing and display for digital radiography.

- Evaluate the technical aspects of radiographic image appearances.
- Control the technical aspects of radiographic image appearances.

Graduate Attributes

- Communication
- Problem Solving
- Information Literacy
- 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