MEDI12005 *Science and Instrumentation 2*
Term 2 - 2020

Profile information current as at 14/12/2025 12:30 pm

General Information

Overview
This unit builds on Science and Instrumentation 1 and aims to provide you with insights about the x-ray generator and timing circuit in the digital environment. You will learn to apply digital image processing, histogram analysis and post-processing concepts to control radiographic image appearances. You will also be introduced to the physical and operational principles of specialised equipment such as orthopantomography (OPG), bone mineral densitometry, mammography, mobile and fluroscopic systems. This unit will help you understand how image quality and dose can be influenced for fluoroscopic systems.

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
Prerequisites: MEDI12001 Radiation Science and MEDI12002 Science and Instrumentation 1
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 2 - 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. **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 Evaluation and Coordinator self-reflection

Feedback

Some students were unclear on some aspects of the instructions and the marking rubric for the group assessment.

Recommendation

Review the instructions and marking rubric to ensure students can address what is expected in the assessment.

Feedback from Student Evaluation and Coordinator self-reflection

Feedback

The supplemental lecture recordings for the face-to-face lectures supported students in making notes and understanding the concepts.

Recommendation

Maintain the provision of supplemental recordings of the face-to-face lectures to support learning and teaching.

Unit Learning Outcomes

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

1. Relate the main sub-components of the x-ray generator to the overall generator operation and the controlled production of radiation
2. Outline the use of automatic exposure timing devices in controlling the duration and quantity of a given exposure and the safe operation of a digital radiographic unit
3. Apply concepts of exposure index, pre-processing and correction, histogram analysis and post-processing to control radiographic image appearances
4. Discuss the design and operational features of the orthopantomography (OPG), bone mineral densitometry, mammography, mobile and fluoroscopic units
5. Discuss the control of image quality and radiation dose in fluroscopy imaging systems.

The 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: 3 Understand and apply the different methods of imaging and treatment (Part a & b)
- Domain 1A: 1 Perform projection radiography in a range of settings (Parts a, d, e & f)
- Domain 1A: 2 Perform fluroscopy and angiography examinations in a range of settings (Parts a, d & e)

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 - Online Test - 40%	•	•	•		

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
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

MEDI12005

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
Students should be having copies of the the textbook since it was used in two units in Term 1 of Year 2. As the textbook will be used in other units during Years 2 of the course, it is recommended that students use the edition listed.

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 - 13 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
X-ray generators and timing circuits • Role in Medical Imaging • Sub-components of an x-ray generator and their role(s) in x-ray production • Overall generator operation in controlling production of x-ray • Key components of automatic exposure control (AEC) • Basic operation of AEC in x-ray exposure control • Advantages and disadvantages of AEC	Essentials of Radiographic Physics & Imaging (3rd edn) • Chapter 4: The x-ray circuit (also see Unit Moodle site for assigned reading from online resources)	Online Tutorial

Week 2 - 20 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Controlling radiographic image appearances - Part 1 • Overview of main stages of image data processing between acquisition and display • Pre-processing and correction • Generation of image histogram • Histogram analysis • Relationship between histogram and exposure index (EI) • Histogram adjustments and their impact on image data and the displayed image • Region of interest(ROI) segmentation	Essentials of Radiographic Physics & Imaging (3rd edn) • Chapter 9: Image quality and characteristics pages 95-102 • Chapter 10: Digital Image receptors pages 122-123 (also see Unit Moodle site for assigned reading from online resources)	Online Tutorial

Week 3 - 27 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Controlling radiographic image appearances - Part 2 • Point processing and local processing of image matrix data • Grayscale mapping using look up table (LUT) • Grayscale mapping in image window adjustment • Spatial location filtering: Convolution • Spatial frequency filtering: High-pass versus low-pass filtering • Spatial frequency processing: Unsharp masking • Geometric operations • Advantages and disadvantages of post-processing	Essentials of Radiographic Physics & Imaging (3rd edn) • Chapter 10: Digital Image receptors pages 122-123 (also see Unit Moodle site for assigned reading from online resources)	Online Tutorial

Week 4 - 03 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Assessment week		Online test 1

Week 5 - 10 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Conventional Mammography and Digital Breast Tomosynthesis (DBT) • Major design features • Factors/principles associated with operation • Technical factors influencing image quality and patient dose • Advantages and disadvantages	See Unit Moodle site for assigned reading from online resources.	Online Tutorial

Vacation Week - 17 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Break week		

Week 6 - 24 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic

Orthopantomography (OPG), bone mineral densitometry (BMD) and mobile units • Constructional features and operation • Technical considerations • Common errors and artifacts encountered with OPG units • Radiation protection rules for mobile units • Advantages and disadvantages	See Unit Moodle site for assigned reading from online resources.	Online Tutorial

Week 7 - 31 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Fluoroscopic imaging systems • Role in Medical Imaging • System configurations • Fluoroscopic imaging chain: analog versus digital • Control of image quality • Safe and effective use of fluoroscopic systems	Essentials of Radiographic Physics & Imaging (3rd edn) • Chapter 15: Fluroscopic Imaging (also see Unit Moodle site for assigned reading from online resources)	Online Tutorial

Week 8 - 07 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Independent consolidation	See unit Moodle site for assigned activities	Online Tutorial

Week 9 - 14 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Independent consolidation	See unit Moodle site for assigned activities	Online Tutorial

Week 10 - 21 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Independent consolidation	See unit Moodle site for assigned activities	Online Tutorial

Week 11 - 28 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Independent consolidation	See unit Moodle site for assigned activities	Online Tutorial

Week 12 - 05 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
Independent consolidation	See unit Moodle site for assigned activities	Online Tutorial

Review/Exam Week - 12 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 19 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
		End of term Online Test

Term Specific Information

MEDI12005 will be delivered online in Term 2, 2020. This unit will be 'front-end loaded' into the first half of the term. The material covered in Weeks 1-3 is foundation knowledge for your study of MEDI12007 Quality Processes for dose and image optimisation and the material on other technologies in Weeks 5-7 is foundation knowledge for MEDI12006 Imaging Procedures 2. Being a six credit unit, you are expected to commit 150 hours to the unit. For Weeks 1-3 and Weeks 5-7 of the term, a suggested breakdown of your time would be:

- 4 hours for watching recorded lectures
- 2 hours for completing assigned reading
- 2 hours for completing other posted learning activities
- 3 - 4 hours for creating study notes
- 2 hours for working on posted tutorial questions in preparation for tutorial
- 1 hour for participation in tutorial

During Weeks 8-12, there will be activities each week on the Moodle site on some topics from earlier in the term for you to work on independently with weekly tutorials available for clarification and consolidation. A suggested time budget would be 5 hours per week for Weeks 8-12. The first online test will be held in Week 4 and the End of term test will be held in Week 14. To help you prepare for the two assessments, it is suggested that you spend at least a total of 30 hours for revision (i.e. 10 hours for the first test and 20 hours for the second test). Take note that tutorials are interactive sessions where your participation enables you to check your understanding of and your ability to apply the weekly 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 Online test 1

Assessment Type
Online Test

Task Description
You will complete an online test in Week 4 to demonstrate your ability to apply the concepts and use the terminology from Weeks 1-3 of the unit. All questions will be based on the posted weekly learning goals. The question tasks will be the same types that you will practice in weekly tutorials. These tasks may include analysis of diagrams, photographs and/or radiographs to explain and discuss concepts. There will be a mixture of problem solving and application of concepts type questions.

As with all other university assessment, colluding with other students on non-group work is considered academic misconduct. Inserting answers from other websites at the time of the online test is considered plagarism. The online test is an open book assessment, however, you must be mindful of the time you are taking to answer each question and have an understanding of the content and familiarity with your resources to use them effectively.

This test is a timed online test via Moodle and will be for a 2 hr duration. You will have an additional ten minute perusal time. This test must be written at the timetabled date and time. As per the Assessment Procedures, this task is to be completed during the defined period. 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, 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 4.

Return Date to Students

Individual feedback will be provided two weeks after the test date.

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 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

- Relate the main sub-components of the x-ray generator to the overall generator operation and the controlled production of radiation
- Outline the use of automatic exposure timing devices in controlling the duration and quantity of a given exposure and the safe operation of a digital radiographic unit
- Apply concepts of exposure index, pre-processing and correction, histogram analysis and post-processing to control radiographic image appearances

Graduate Attributes

- Communication
- Problem Solving
- Information Technology Competence

2 End of term Online test

Assessment Type
Online Test

Task Description
You will complete an end of term online test in Week 14 to demonstrate your ability to apply the concepts and the use of terminology learned in 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 the weekly tutorials. These tasks may include analysis of diagrams, photographs and/or radiographs to explain and discuss concepts. There will be a mixture of problem solving and application of concepts type questions.

As with all other university assessment, colluding with other students on non-group work is considered academic misconduct. Inserting answers from other websites at the time of the online test is considered plagarism. The online test is an open book assessment, however, you must be mindful of the time you are taking to answer each question and have an understanding of the content and familiarity with your resources to use them effectively.

The test is a timed online test via Moodle and will be for a 3 hr duration. You will have an additional ten minutes perusal 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. **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

Individual feedback will be provided two weeks after the test 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 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

- Discuss the design and operational features of the orthopantomography (OPG), bone mineral densitometry, mammography, mobile and fluoroscopic units
- Discuss the control of image quality and radiation dose in fluroscopy imaging systems.

Graduate Attributes

- Communication
- Problem Solving

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