



# MEDI12005 *Science and Instrumentation 2*

## Term 2 - 2017

Profile information current as at 10/04/2024 04:02 pm

All details in this unit profile for MEDI12005 have been officially approved by CQUniversity and represent a learning partnership between the University and you (our student). The information will not be changed unless absolutely necessary and any change will be clearly indicated by an approved correction included in the profile.

### 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 about exposure technique charts and their application in digital x-ray systems. You will also be introduced to the physical and operational principles of orthopantomography (OPG), mammography, mobile and fluoroscopic systems. This unit will help you further understand how image quality and dose can be influenced for fluoroscopic systems. You will use a digital radiological simulation lab and a mobile x-ray unit 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

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 - 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: 20%

#### 2. **Practical and Written Assessment**

Weighting: 20%

#### 3. **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 Coordinator reflection

##### Feedback

Tutorial room allocation

##### Recommendation

Due to students from other courses having practice sessions that contributed to noise levels, the room allocated for the repeat tutorial session was not suitable towards the later weeks of the term. Recommend liaising with timetabling to avoid this in future delivery of the unit.

#### Feedback from Have your say Coordinator reflection

##### Feedback

Understanding of the assessment requirements and marking rubric(s)

##### Recommendation

Create more precise instruction videos that focus on each assessment item. Include examples of poor and good approaches with respect to the marking rubric to encourage better understanding of the assessment requirements and marking rubric(s) by students.

#### Feedback from Have your say Coordinator reflection

##### Feedback

Timing of lectures

##### Recommendation

The students had back to back lectures on the same day for 3 courses. This affected focus and retention of information. Review the timing of lecture delivery to maximise student engagement.

## Unit Learning Outcomes

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

1. Relate the main subcomponents of the x-ray generator to the overall generator operation and the controlled production of radiation.
2. Outline the use of exposure timing devices in controlling the duration of a given exposure and the safe operation of a digital radiographic unit.
3. Construct a technique chart for a general radiographic unit with digital image receptor system.
4. Discuss the design and operational features of the orthopantomography (OPG), mammography, mobile and fluoroscopic units.
5. Analyse how image quality and radiation dose can be controlled for fluoroscopic systems.

## Alignment of Learning Outcomes, Assessment and Graduate Attributes



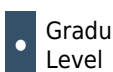
N/A  
Level



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) - 20%	•	•		•	•

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
2 - Practical and Written Assessment - 20%			•		
3 - 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) - 20%	•	•		•						
2 - Practical and Written Assessment - 20%		•		•	•	•				
3 - In-class Test(s) - 60%	•	•		•						

## Textbooks and Resources

### Textbooks

MEDI12005

#### Prescribed

##### **Radiological science for technologists: physics, biology and protection**

Edition: 11th edn (2016)

Authors: Bushong, S

Mosby Elsevier

St Louis , MO , USA

ISBN: 9780323353779

Binding: Hardcover

MEDI12005

#### Prescribed

##### **The essential physics of medical imaging**

Edition: 3rd edn (2011)

Authors: Bushberg, J Siebert, J Leidholdt, E Boone, J

Lippincott, Williams & Wilkins

Philadelphia , PA , USA

Binding: Hardcover

#### **Additional Textbook Information**

Students should be having copies of the two textbooks since they were used in two units in Term 1 of Year 2. As these textbooks will be used in four units during Years 2 and 3 of the course, it is recommended that students use the editions 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](mailto:r.d.kumar@cqu.edu.au)

## Schedule

### **Week 1 - 10 Jul 2017**

Module/Topic	Chapter	Events and Submissions/Topic
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### **Week 2 - 17 Jul 2017**

Module/Topic	Chapter	Events and Submissions/Topic
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### **Week 3 - 24 Jul 2017**

Module/Topic	Chapter	Events and Submissions/Topic
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**Week 4 - 31 Jul 2017**

Module/Topic	Chapter	Events and Submissions/Topic
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**Week 5 - 07 Aug 2017**

Module/Topic	Chapter	Events and Submissions/Topic
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**Vacation Week - 14 Aug 2017**

Module/Topic	Chapter	Events and Submissions/Topic
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**Week 6 - 21 Aug 2017**

Module/Topic	Chapter	Events and Submissions/Topic
X-ray Generators <ul style="list-style-type: none"> <li>• Role in Medical Imaging</li> <li>• Major components</li> <li>• Types of generators, operation, advantages versus disadvantages</li> </ul>	Refer to the reading list on the unit Moodle site.	

**Week 7 - 28 Aug 2017**

Module/Topic	Chapter	Events and Submissions/Topic
Timing circuits <ul style="list-style-type: none"> <li>• Role in Medical Imaging</li> <li>• Types of timers</li> <li>• AEC components and operation</li> <li>• APR system</li> </ul>	Refer to the reading list on the unit Moodle site.	Lab 1

**Week 8 - 04 Sep 2017**

Module/Topic	Chapter	Events and Submissions/Topic
Exposure technique charts <ul style="list-style-type: none"> <li>• Roles &amp; limitations</li> <li>• Types (including characteristics, advantages and disadvantages)</li> <li>• Constructing an exposure technique chart</li> </ul>	Refer to the reading list on the unit Moodle site.	Lab 2

**Week 9 - 11 Sep 2017**

Module/Topic	Chapter	Events and Submissions/Topic
OPG units <ul style="list-style-type: none"> <li>• Constructional features and operation</li> <li>• Common errors and artifacts</li> <li>• Advantages and disadvantages</li> </ul>	Refer to the reading list on the unit Moodle site.	Lab 3

**Week 10 - 18 Sep 2017**

Module/Topic	Chapter	Events and Submissions/Topic
Fluoroscopic Imaging chain <ul style="list-style-type: none"> <li>• Analog versus digital</li> <li>• Image contrast, spatial resolution and signal-to-noise ratio</li> <li>• Safe and effective use of Fluoroscopic systems</li> </ul>	Refer to the reading list on the unit Moodle site.	Lab 4

**Week 11 - 25 Sep 2017**

Module/Topic	Chapter	Events and Submissions/Topic
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Conventional Mammography and Digital Breast Tomosynthesis (DBT)

- Major components of conventional mammography unit
- Factors/principles associated with operation of conventional mammography unit
- Contribution of technical factors to image quality and patient dose in conventional mammography
- Features of DBT unit
- Principles of digital breast tomosynthesis
- Comparison of conventional mammography with DBT

Refer to the reading list on the unit Moodle site.

Lab 5

#### Week 12 - 02 Oct 2017

Module/Topic	Chapter	Events and Submissions/Topic
Mobile units <ul style="list-style-type: none"> <li>• Types, operation, advantages and disadvantages</li> <li>• Technical considerations</li> <li>• Radiation protection rules</li> </ul>	Refer to the reading list on the unit Moodle site.	<b>Exposure technique chart</b> Due: Week 12 Monday (2 Oct 2017) 4:00 pm AEST

#### Review/Exam Week - 09 Oct 2017

Module/Topic	Chapter	Events and Submissions/Topic
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#### Exam Week - 16 Oct 2017

Module/Topic	Chapter	Events and Submissions/Topic
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## Term Specific Information

This is a condensed unit that runs from Weeks 6 -14, as most of you are on placement during the first 5 weeks of term. Being a six credit unit, you are still expected to commit 150 hours to the unit, which equates to about 16.7 hours per week over the 9 weeks. There will be a total of five labs from Weeks 7 to 11. Take note that you are to adhere to the Course Dress Code when using the Medical Imaging simulation labs and a zero-tolerance policy will be followed.

## Assessment Tasks

### 1 In-class Test 1

#### Assessment Type

In-class Test(s)

#### Task Description

This is the first assessment task worth 20% of the final unit grade. It will be held during scheduled class time in Week 8. The purpose of this test is to assess your understanding of the topics related to Weeks 6 and 7 of the unit content as detailed in the posted weekly learning outcomes. There will be a mixture of recall, problem solving and application of concepts to imaging situations type questions. The total possible marks and the marks for each question will be indicated on the test paper.

There will be four parts to the test. Part 1 has True/False questions with explanations where you will be required to state whether the information is true or false and provide an explanation to support your decision. Part 2 has Fill-in-the-blank questions where you will be required to provide the correct term or phrase to complete the sentence. Correct spelling is compulsory in this section. Part 3 has short answer questions where you will be required to answer a set of main questions (comprising of 2-3 sub-questions within each) on a broad topic from Weeks 6 & 7. Part 4 consists of one question on a broad topic from Weeks 6 & 7 and will test your demonstration of theory concepts using explanations which may include drawing diagrams to illustrate the points made. Further details of the test breakdown and mark allocation will be made available on the unit Moodle site.

**As per the Assessment Policy and Procedure (Higher education Coursework), this In-class test must be written at the scheduled time. There is no ability to apply a late penalty. In the absence of an approved**

**assessment extension, if you do not write the test at the scheduled time, your mark on the test will be zero.**

### **Assessment Due Date**

This test will be held during scheduled class time in Week 8.

### **Return Date to Students**

Two weeks after the test due date.

### **Weighting**

20%

### **Assessment Criteria**

Each question on the In-class test will indicate the number of marks per segment. Responses are scored based on:

- correct indication that statement is true or false
- correct use of terminology
- factual correctness of explanations of concepts, including applications and illustration(s)
- relevance of stated content to the question asked
- application of theory concepts to the question asked
- clarity, thoroughness and completeness of explanations
- logic of problem-solving

### **Referencing Style**

- [Harvard \(author-date\)](#)

### **Submission**

Offline Online

### **Learning Outcomes Assessed**

- Relate the main subcomponents of the x-ray generator to the overall generator operation and the controlled production of radiation.
- Outline the use of exposure timing devices in controlling the duration of a given exposure and the safe operation of a digital radiographic unit.
- Discuss the design and operational features of the orthopantomography (OPG), mammography, mobile and fluoroscopic units.
- Analyse how image quality and radiation dose can be controlled for fluoroscopic systems.

### **Graduate Attributes**

- Communication
- Problem Solving
- Information Literacy

## **2 Exposure technique chart**

### **Assessment Type**

Practical and Written Assessment

### **Task Description**

This is a group based assessment and it is worth 20 % of the final unit grade. The purpose of this assessment is to measure your progress towards attaining the following unit learning outcome:

3. Construct a technique chart for a general radiographic unit with digital image receptor system.

You will be required to work in your selected groups during the scheduled lab sessions to create a full exposure technique chart such as one would expect to see in the clinical environment for use with either the DR or the CR Radiography lab. You will use the content learned in Week 8 to help you generate the exposure technique chart for all body parts, all beam paths and all patient sizes, including paediatrics. You are to participate in the laboratory activities to generate the full exposure technique chart and the compilation of the submitted group work. There will be one technical report submitted per group outlining how the technical factors were determined and what underlying theories were used in extrapolating factors for various body parts and body sizes. Once you have produced your baseline images, each member of the group will be responsible for one of the main body regions to extrapolate values. The images or list of images in PACS would also need to be included as supporting evidence of your work.

Your submission must be a word-processed document with appropriate layout including relevant headings and subheadings that enable information to be easily read. Acceptable file types are Word document (either .doc or .docx format) or pdf file that is a conversion of a word-processed document (NOT an image file such as a scanned document).



All submissions must be processed through TURNITIN. Ensure that your document includes a header with your name and student number and a footer with the unit code and term/year. Please note that further details regarding the requirements for the technique chart will be provided on the unit Moodle site.

**Assessment Due Date**

Week 12 Monday (2 Oct 2017) 4:00 pm AEST

**Return Date to Students**

Monday (16 Oct 2017)

**Weighting**

20%

**Assessment Criteria**

The Exposure technique chart will be assessed on the following criteria:

- Introduction
- Definition of an exposure technique chart
- Purpose(s) of an exposure technique chart
- Method used to generate the exposure technique chart
- Discussion of applicability and limitations of the anthropomorphic phantoms used
- Clarity and correctness of the exposure technique chart generated
- Applicability and appropriateness of the exposure technique chart created with respect to the DR/CR room
- Selection, analysis and application of relevant theory in the generation and the clinical application of the exposure technique chart
- Conclusion
- Referencing

**Referencing Style**

- [Harvard \(author-date\)](#)

**Submission**

Online Group

**Learning Outcomes Assessed**

- Construct a technique chart for a general radiographic unit with digital image receptor system.

**Graduate Attributes**

- Problem Solving
- Information Literacy
- Team Work
- Information Technology Competence

## 3 In-class Test 2

**Assessment Type**

In-class Test(s)

**Task Description**

This is the second In-class test and it has more questions to complete compared to the first assessment. Accordingly, it has a higher weighting of 60% towards the final grade. You must pass this assessment task to pass the unit.

This In-class test will be held during scheduled class time in Week 14. The purpose of this test is to assess your understanding of the topics related to Weeks 9 to 12 of the unit content as detailed in the posted weekly learning outcomes. There will be a mixture of recall, problem solving and application of concepts to imaging situations type questions. The total possible marks and the marks for each question will be indicated on the test paper. Further details of the test breakdown and mark allocation will be made available on the unit Moodle site.

**As per the Assessment Policy and Procedure (Higher Education Coursework), this In-class test must be written at the scheduled time. There is no ability to apply a late penalty. In the absence of an approved assessment extension, if you do not write the test at the scheduled time, your mark on the test will be zero.**

**Assessment Due Date**

The In-class test will be held during timetabled class time.

**Return Date to Students**

Two weeks after the test due date.

**Weighting**

60%

**Minimum mark or grade**

50%

**Assessment Criteria**

Each question on the In-class test will indicate the number of marks per segment. Responses are scored based on:

- correct indication that statement is true or false
- correct use of terminology
- factual correctness of explanations of concepts, including applications and illustration(s)
- relevance of stated content to the question asked
- application of theory concepts to the question asked
- clarity, thoroughness and completeness of explanations
- logic of problem-solving

**Referencing Style**

- [Harvard \(author-date\)](#)

**Submission**

Offline Online

**Learning Outcomes Assessed**

- Relate the main subcomponents of the x-ray generator to the overall generator operation and the controlled production of radiation.
- Outline the use of exposure timing devices in controlling the duration of a given exposure and the safe operation of a digital radiographic unit.
- Discuss the design and operational features of the orthopantomography (OPG), mammography, mobile and fluoroscopic units.
- Analyse how image quality and radiation dose can be controlled for fluroscopic systems.

**Graduate Attributes**

- Communication
- Problem Solving
- Information Literacy

## 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