HLTH304
Radiographic Physics, Practice and Protection
S1 Day 2015
Dept of Chiropractic

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# General Information

Unit convenor and teaching staff

**Convener**
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C5C 347  
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Subramanyam Vemulpad  
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**Credit points**
3

**Prerequisites**
(39cp including 12cp at 200 level) or admission to GDipChiroSc

**Corequisites**

**Co-badged status**
CHIR606
Unit description
This unit is conducted to develop students' knowledge in the underlying physical principles of medical radiation science. The unit is presented in three distinct modules: - Module 1 is the study of Radiation Physics, its principles and current technology of imaging equipment. - Module 2 is the study of the principles and practice of image production and image processing techniques. - Module 3 describes the biological effects of radiation as well as current radiation protection techniques.

Important Academic Dates
Information about important academic dates including deadlines for withdrawing from units are available at [http://students.mq.edu.au/student_admin/enrolmentguide/academicdates/](http://students.mq.edu.au/student_admin/enrolmentguide/academicdates/)

Learning Outcomes
1. Summarise the physics of electricity & magnetism
2. Explain the production and properties of x-ray and how they interact with matter
3. Critically appraise the principles of radiographic image production and processing
4. Contrast the generation and use of advanced imaging modalities
5. Explain the biological effects of radiation
6. Summarise radiation protection in relation to radiography

General Assessment Information
Attendance at the 3 laboratory sessions across the semester, covering each of the different experiments is compulsory. A missed session must be made up prior to week 13.

Submission of assignments will be through ilearn unless otherwise indicated.

Late submission of assignments will result in a grade deduction of 10% per day late. Submissions handed in more than 1 week after the due date will not be assessed.

Extensions to assessment due dates may be granted under extenuating circumstances. Application for extensions must be made under the disruption to studies policy ([http://students.mq.edu.au/student_admin/exams/disruption_to_studies/](http://students.mq.edu.au/student_admin/exams/disruption_to_studies/)), applied for through [www.ask.mq.edu.au](http://www.ask.mq.edu.au) within 5 days of the disruption and prior to the submission date of the assignment.

Resubmission of work or resitting of exams will not be considered under usual circumstances. If resubmission or resitting is considered, a grade of 50% will be the maximum achievable.

If a practical exam, slide exam or theory exam is missed a supplementary exam will only be considered under the disruption to studies policy ([http://students.mq.edu.au/student_admin/exams/disruption_to_studies/](http://students.mq.edu.au/student_admin/exams/disruption_to_studies/)), applied for through [www.ask.mq.edu.au](http://www.ask.mq.edu.au) within 5 days of the disruption.
## Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 1</td>
<td>5%</td>
<td>25 March 5pm</td>
</tr>
<tr>
<td>Laboratory work</td>
<td>15%</td>
<td>varies for each prac group</td>
</tr>
<tr>
<td>Mid semester exam</td>
<td>20%</td>
<td>27 March; 10-12 (in class)</td>
</tr>
<tr>
<td>Assignment 2</td>
<td>10%</td>
<td>6 May 5pm</td>
</tr>
<tr>
<td>Final Examination</td>
<td>50%</td>
<td>University Exam period</td>
</tr>
</tbody>
</table>

### Assignment 1

Due: **25 March 5pm**  
Weighting: **5%**

Online quiz; available on iLearn from Friday 6/3/15

This Assessment Task relates to the following Learning Outcomes:  
- Summarise the physics of electricity & magnetism  
- Explain the production and properties of x-ray and how they interact with matter

### Laboratory work

Due: **varies for each prac group**  
Weighting: **15%**

3 experiments will be performed across the course of semester starting in week 3 or 4. You will be allocated a group and the timetable of which weeks you are to attend will be posted on iLearn.

This Assessment Task relates to the following Learning Outcomes:  
- Summarise the physics of electricity & magnetism  
- Explain the production and properties of x-ray and how they interact with matter

### Mid semester exam

Due: **27 March; 10-12 (in class)**  
Weighting: **20%**

In-class exam based on Module 1 lectures (lectures weeks 2-4)
This Assessment Task relates to the following Learning Outcomes:
   • Summarise the physics of electricity & magnetism
   • Explain the production and properties of x-ray and how they interact with matter

Assignment 2
Due: 6 May 5pm
Weighting: 10%

Assignment 2 will be available and submitted through ilearn. More information regarding this will be available early in semester.

This Assessment Task relates to the following Learning Outcomes:
   • Critically appraise the principles of radiographic image production and processing

Final Examination
Due: University Exam period
Weighting: 50%

Exam material from Introduction lecture and modules 2 and 3

This Assessment Task relates to the following Learning Outcomes:
   • Explain the production and properties of x-ray and how they interact with matter
   • Critically appraise the principles of radiographic image production and processing
   • Contrast the generation and use of advanced imaging modalities
   • Explain the biological effects of radiation
   • Summarise radiation protection in relation to radiography

Delivery and Resources
2-hour lectures every week and 3-hour practical laboratory for 3 specified weeks per student.

The web page for this unit can be found at: https://ilearn.mq.edu.au and following the links for either Postgraduate or Undergraduate students

REQUIRED TEXTS/MANUALS
Radiological Science For Technologists - Physics, Biology and Protection. - Stewart C Bushong


REFERENCES


Introduction to Radiologic Technology. - LaVerne Tolley Gurley & William J. Callaway (7th Edition); Mosby St Louis 2011

**Unit Schedule**

**WEEK 1  Hazel Jenkins**


**WEEK 2/3  Rich Mildren**


**WEEK 3/4  Rich Mildren**

X-ray tubes. What are X-rays and how are they produced. X-ray interactions.

**WEEK 5     MID SEMESTER EXAM**

**WEEK 6    No Lecture: PUBLIC HOLIDAY**

**WEEK 7  Anthony Buxton**

Image formation. Optical Density and Contrast as related to exposure parameters: milliamperes (mA), time (s), milliampere seconds (mAs), Kilovoltage (kVp), distance (SID or FFD). Variable kVp techniques. Radiographic film. Film processing. Sensitometry & densitometry. Characteristic curve. Intensifying screens – Construction; Spectral matching; Screen speed; Quantum mottle. Film/screen cassettes;

**WEEK 8  Anthony Buxton**


**WEEK 9  Anthony Buxton**


**WEEK 10 Anthony Buxton**

Special radiographic equipment (Fluoroscopy, CT, MRI).

**WEEK 11 Subra Vemulpad**

Biological effects of radiation. The Law of Bergonne & Tribondeau. Linear energy transfer. Types of cell damage.

**WEEK 12 Subra Vemulpad**
Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:


In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: [https://students.mq.edu.au/support/student_conduct/](https://students.mq.edu.au/support/student_conduct/)

Results

Results shown in iLearn, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

Student Support

Macquarie University provides a range of support services for students. For details, visit [http://students.mq.edu.au/support/](http://students.mq.edu.au/support/)

Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- **Workshops**
- **StudyWise**
- **Academic Integrity Module for Students**
Graduate Capabilities

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Summarise the physics of electricity & magnetism
- Explain the production and properties of x-ray and how they interact with matter
- Critically appraise the principles of radiographic image production and processing
- Contrast the generation and use of advanced imaging modalities
- Explain the biological effects of radiation
- Summarise radiation protection in relation to radiography

Assessment tasks

- Assignment 1
- Laboratory work
- Mid semester exam
- Assignment 2
Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

**Learning outcomes**

- Critically appraise the principles of radiographic image production and processing
- Summarise radiation protection in relation to radiography

**Assessment tasks**

- Assignment 2
- Final Examination

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

**Learning outcome**

- Summarise radiation protection in relation to radiography

**Assessment task**

- Final Examination

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation’s historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:
Learning outcomes

• Explain the biological effects of radiation
• Summarise radiation protection in relation to radiography

Assessment task

• Final Examination

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

• Critically appraise the principles of radiographic image production and processing
• Summarise radiation protection in relation to radiography

Assessment tasks

• Assignment 2
• Final Examination

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

• Critically appraise the principles of radiographic image production and processing
• Summarise radiation protection in relation to radiography

Assessment tasks

• Assignment 2
• Final Examination
Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

**Learning outcomes**

- Summarise the physics of electricity & magnetism
- Explain the production and properties of x-ray and how they interact with matter
- Critically appraise the principles of radiographic image production and processing
- Contrast the generation and use of advanced imaging modalities
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**Assessment tasks**

- Assignment 1
- Laboratory work
- Mid semester exam
- Assignment 2
- Final Examination

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

**Learning outcomes**

- Explain the biological effects of radiation
- Summarise radiation protection in relation to radiography

**Assessment task**

- Final Examination