HLTH304

Radiographic Physics, Practice and Protection

S1 Day 2014

Chiropractic

Contents

General Information

Unit convenor and teaching staff
Lecturer
Hazel Jenkins
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C5C 347
Tuesday 9am-1pm

A/Professor
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Unit Convenor
Subramanyam Vemulpad
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C5C West 351
Tuesday 10 am -12 noon

Credit points
3

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

Corequisites

Co-badged status
HLTH204

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 https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

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

Explain the physics of electricity & magnetism

Explain the production and properties of x-ray; the properties of x-rays and atomic structure

Critically appraise the principles of image production & processing

Explain quality control in relation to radiography

Critically appraise the biological effects of radiation

Assessment Tasks

Name	Weighting	Due
Assignment 1	5%	2 April; 2 pm
Laboratory work	15%	varies for each prac group
Mid semester exam	20%	4 April; 10-12 (in class)
Assignment 2	10%	14 May; 2 pm
Final Examination	50%	University Exam period

Assignment 1

Due: **2 April; 2 pm**
Weighting: **5%**

On successful completion you will be able to:

- Explain the physics of electricity & magnetism
- Explain the production and properties of x-ray; the properties of x-rays and atomic structure

Laboratory work

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

On successful completion you will be able to:

- Explain the physics of electricity & magnetism
- Explain the production and properties of x-ray; the properties of x-rays and atomic structure
- Explain quality control in relation to radiography

Mid semester exam

Due: **4 April; 10-12 (in class)**
Weighting: **20%**

On successful completion you will be able to:

- Explain the physics of electricity & magnetism
- Explain the production and properties of x-ray; the properties of x-rays and atomic structure

Assignment 2

Due: **14 May; 2 pm**
Weighting: **10%**

On successful completion you will be able to:

- Explain the physics of electricity & magnetism
- Explain the production and properties of x-ray; the properties of x-rays and atomic structure
- Critically appraise the principles of image production & processing
- Explain quality control in relation to radiography

Final Examination

Due: **University Exam period**
Weighting: **50%**

Modules 2 and 3

On successful completion you will be able to:

- Explain the production and properties of x-ray; the properties of x-rays and atomic structure
- Critically appraise the principles of image production & processing
- Explain quality control in relation to radiography
- Critically appraise the biological effects of radiation

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/Books

Radiological Science For Technologists - Physics, Biology and Protection. - Stewart C Bushong 10th Edition, Elsevier, 2013.

Lab book for practicals – available from Co-op book store.

REFERENCES

Essentials of Radiologic Science. - Robert A. Fosbinder & Denise Orth; Philadelphia : Wolters Kluwer Health/Lippincott Williams & Wilkins. 2010

Principles of Radiological Physics. - Robin Wilks, (2nd Edition), Churchill Livingstone Edinburgh. 1987

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

Unit Schedule

WEEK 1 Hazel Jenkins

Introduction. Explanation of syllabus. Historical background of the discovery of Xrays. Atoms and atomic structure. Normal radiographic anatomy

WEEK 2/3 Rich Mildren

Electricity and magnetism. Electric currents. Electromagnetic radiation. X-ray circuits.

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 Hazel Jenkins

Image formation. Optical density. Automatic Exposure Control (AEC). Density controls. Contrast. Milliamperes (mA), Kilovoltage (kVp), Distance (SID), KVp and image density. Variable kVp techniques. Image sharpness.

WEEK 7 Hazel Jenkins

Radiographic film. Film processing. Sensitometry & densitometry. Characteristic curve. Intensifying screens – Construction; Spectral matching; Screen speed; Quantum mottle Film/screen

cassettes; Grids and scatter reduction.

WEEK 8 Hazel Jenkins

Film processing. Automatic processors. Film storage & handling. The darkroom. Effects of concentration, time & Radiographic quality control. Image artefacts

WEEK 9 Subra Vemulpad

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

WEEK 10 Subra Vemulpad

Direct & indirect effects. High-dose radiation effects. Radiation & pregnancy. Genetic effects.

WEEK 11 Farouk Badawi

Radiation protection. Reduction of radiation dose to the patient. Reduction of radiation exposure to the staff. Effective dose. Regulations. Radiation detectors. Natural background radiation. Intensifying screens – Construction Spectral matching Screen speed Quantum mottle Film/screen cassettes. Grids and scatter reduction.

WEEK 12 Hazel Jenkins Special radiographic equipment (Fluoroscopy, CT, MRI, Digital Imaging). Digital processors - CR and DR.

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:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

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/

Student Support

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

Learning Skills

Learning Skills (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
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

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 image production & processing
- Explain quality control in relation to radiography

Assessment tasks

- Assignment 1
- Laboratory work
- Mid semester exam
- 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 image production & processing
- Explain quality control in relation to radiography

Assessment tasks

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

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

- Explain the physics of electricity & magnetism
- Explain the production and properties of x-ray; the properties of x-rays and atomic structure
- Critically appraise the principles of image production & processing
- Explain quality control in relation to radiography
- Critically appraise the biological effects of radiation

Assessment tasks

- Assignment 1
- Laboratory work
- Mid semester exam
- 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

- Explain the production and properties of x-ray; the properties of x-rays and atomic structure
- Critically appraise the principles of image production & processing
- Explain quality control in relation to radiography
- Critically appraise the biological effects of radiation

Assessment tasks

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

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 image production & processing
- Explain quality control in relation to radiography

Assessment tasks

- Assignment 1
- Laboratory work
- Mid semester exam
- 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

- Explain quality control in relation to radiography

Assessment tasks

- Assignment 1
- Laboratory work
- Mid semester exam
- Assignment 2
- 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 quality control in relation to radiography
- Critically appraise the biological effects of radiation

Assessment tasks

- Laboratory work
- 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 quality control in relation to radiography
- Critically appraise the biological effects of radiation

Assessment tasks

- Laboratory work
- Assignment 2
- Final Examination