

Course Specification

RARD 516: Radiation Protection and Safety

Institution Name: Mahidol University
Campus/Faculty/Department: Faculty of Medicine, Ramathibodi Hospital, Department of Diagnostic and Therapeutic Radiology

Section 1: General information

1. Course number and name

Course number: RARD 516
Course name: Radiation Protection and Safety

2. Credits: 2(1-3-2)

3. Curriculum and type of course

3.1 Curriculum: Radiation Protection and Safety
3.2 Type of course: core course

4. Instructors

4.1 Course Coordinator: Asst.Prof. Dr. Sawwanee Asavaphatiboon
4.2 Instructors:

Asst.Prof. Dr. Sawwanee Asavaphatiboon

Lecturer Dr. Puangpen Tangboonduangjit

Lecturer Dr. Krisanat Chuamsamarkkee

Lecturer Dr. Nualjun Satansook

Lecturer from Office of Atoms for Peace (OAP) and Thailand Institute of Nuclear Technology (Public Organization)

5. Semester/Year: 2nd Semester, Academic Year 2019, 1st year students

6. Pre-requisite: None

7. Co – requisites: None

8. Classroom: To be announced

9. Revision Date: 31st July 2019

Section 2: Purpose and objective

1. Course Learning Outcomes

- 1.1 Student can explain the principles and definition of quantities of radiation protection
- 1.2 Student can design, calculate and plan radiation protection and shielding design of radiotherapy, diagnostic radiology and nuclear medicine
- 1.3 Student can describe and assess of radiation exposure from external source and take of radionuclide
- 1.4 Student can identify and aware the medical exposure in radiotherapy, diagnostic radiology and nuclear medicine
- 1.5 Student can describe how to transport radioactive and manage radioactive waste and emergency situation
- 1.6 Student can explain the management of safe transportation and radioactive waste
- 1.7 Student can value the professional conduct of radiation protection in Radiology

Section 3: Course details

1. Course Description

Radiation weighting factors; equivalent dose; tissue weighting factors; risk assessment; types of exposure : occupation , medicine and public ; international organizations in radiation protection, assessment of radiation exposure from external and internal sources; monitoring programme; biokinetic models; MIRDA calculation; radiation protection against: occupational, medical, and public ; safe transport of radioactive materials; radioactive waste management; management of chronic and emergency exposure situations; ethics of radiation protection

2. Hours per semester:

Lecture	15 hours
Practice	45 hours
Self-study	30 hours

3. Pre-test and Assignments feedback: Within 2-4 weeks

Section 4: Course Learning Outcomes

Course level learning outcomes	Programme level learning outcomes	Methods	Assessment
1. Student can explain the principles and definition of quantities of radiation protection	ELO 2	- Lecture - Class discussion - Assigned readings	- Paper/oral Examination
2. Student can design, calculate and plan radiation protection and shielding design of each division	ELO 1, 2	- Lecture - Practice - Assignment	- Paper/oral Examination - Rubric experiment report assessment
3. Student can describe and assess of radiation exposure from external source and take of radionuclide	ELO 1, 2	- Lecture - Class discussion - Assignment	Paper/oral Examination - report
4. Student can identify and aware the medical exposure in radiotherapy, diagnostic radiology and nuclear medicine	ELO 1,2	- Lecture - Class discussion - Assigned readings	- Paper/oral Examination
5. Student can describe how to transport radioactive and manage radioactive waste and emergency situation	ELO 2,4	- Lecture - Practice - Assignment	- Paper/oral Examination - Rubric experiment report assessment
6. Student can explain the management of safe transportation and radioactive waste	ELO 2,4	- Lecture - Practice - Assignment	- Paper/oral Examination - Rubric experiment report assessment
7. Student can value the professional conduct of radiation protection in Radiology	ELO 2, 4,5	- Assigned readings	- Rubric writing assessment

Section 5: Lesson plan and assessment

1. Lesson plan

Time(hr)	Topics	Instructors	Method	Assessment
1	General principles to radiation protection and regulatory control	Lect.Dr. Puangpen	- Lecture - Class discussion	- Examination
1	Quantities used in radiation protection	Lect.Nualjun	- Lecture - Class discussion	- Examination
1	Radiation risk assessment	Lect.Dr.Kanokrat	- Lecture - Class discussion	- Examination
3	Practical work 1: Calculation of internal dose using ICRP models in case of acute and chronic exposure	Lect.Dr.Kanokrat	- Practice - Class discussion	- Examination - Report
1	Assessment of occupational exposure - due to external radiation	Lect.Dr.Sawwane	- Lecture - Class discussion	- Examination
1	Assessment of occupational exposure - due to intake radionuclide	Lect.Dr.Krisanat	- Lecture - Class discussion	-Examination
1	Structural shielding design of radiotherapy facilities	Lect.Dr. Puangpen	- Lecture - Class discussion - Assignment	- Examination = Assignment report
3	Practical work 2: Radiation survey in radiotherapy	Lect.Dr. Puangpen	- Practice - Class discussion	- Examination - Report
1	Structural shielding design of medical x-ray imaging facilities	Lect.Dr.Sawwane	- Lecture - Class discussion - Assignment	- Examination - Assignment report
3	Practical work 3: Radiation survey in diagnostic radiology	Lect.Dr.Sawwane	- Practice - Class discussion	- Examination - Report

Time(hr)	Topics	Instructors	Method	Assessment
3	Practical work 4: Occupational dose evaluation using Optical Stimulated Luminescence (OSL) Personal Dosimeter	Lect. Sataporn	- Practice - Class discussion	- Examination - Report
1	Medical Exposure in Diagnostic Radiology	Lect.Dr.Sawwanee	- Lecture - Class discussion	-Examination
1	Medical Exposure in Radiotherapy	Lect.Dr.Thiti	- Lecture - Class discussion	-Examination
1	Medical Exposure in Nuclear Medicine	Lect.Dr.Krisanat	- Lecture - Class discussion	-Examination
1	Structural shielding design of nuclear medicine facilities	Lect.Dr.Krisanat	- Lecture - Class discussion - Assignment	- Examination - Assignment report
3	Practical work 5: Radiation survey in nuclear medicine	Lect.Dr.Krisanat	Practice Class discussion	- Examination - Report
3	Practical work 6: Radiation detection by several types of survey meters	Lect. Thongchai Lect. Vithit	Practice Class discussion	- Examination - Report
3	Practical work 7: Survey meter: Calibration of survey meters	Lect. Thongchai Lect. Vithit	Practice Class discussion	- Examination - Report
6	Practical work 8: Simulation of lost source search and Safe transport of radioactive materials	Lect. Jitpan	Practice Class discussion	- Examination - Report
1	Exposure of the public from practices:Radioactive waste safety management	Lect. Archara/Anan	- Lecture - Class discussion	-Examination
3	Practical work 9: Control and practices in management of radioactive waste	Lect. Archara/Anan	Practice Class discussion	- Examination - Report

Time(hr)	Topics	Instructors	Method	Assessment
1	Radioactive contamination monitoring and its decontamination	Lect. Archara/Anan	- Lecture - Class discussion	-Examination
3	Practical work 10: Radioactive contamination monitoring and its decontamination	Lect. Archara/Anan	Practice Class discussion	- Examination - Report
2	Intervention for chronic and emergency exposure situations	Lect. Kittipong	- Lecture - Class discussion	-Examination
1	Exposure of the public from practices:Dose assessment and monitoring	Lect. Krisanat	- Lecture - Class discussion	- Examination - Report

2. Measurement and Evaluation of Student Achievement

2.1 Theory Examination (short, long answer questions) 70%

2.2 Experiment report 30%

Section 6: Assessment and improvement of the course operation

1. Strategies to assess the effectiveness of the courses by the students

Assessment of instructor's teaching by student

2. Strategy to assess the instruction

Assessment of students' learning records

Assessment of instructor's teaching by student

3. Improvement of Instruction

Consider the students' learning records

Consider the students' assessment of instructor's teaching

Consider the program committee's comment

4. Verification of student achievement in the subject

By program committee and faculty-level academic committee

5. Review and action plan to improve the effectiveness of the course

Using the results from 1 - 4 as inputs to the instruction improvement

Learning Resources

- IAEA Safety standards for protecting people and the environment, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards: General Safety Requirements Part 3, interim edition, Nov 2011.
- Radiological protection for Medical exposure to ionizing radiation; Safety standards series No. RS-G-1.5, 2002.
- IAEA Safety standards series: Assessment of Occupational Exposure Due to External Sources of Radiation. Aug 1999.
- IAEA Safety standards series: Occupational Radiation Protection. Oct 1999.
- IAEA Safety standards series: Assessment of Occupational Exposure Due to Intake or radionuclide. Oct 1999.
- Structural shielding design of medical x-ray imaging facilities. NCRP report No. 147, 2004.
- Mark T. Madsen, et.al. AAPM Task group 108: PET and PET/CT shielding requirements. Med phys.33 (1), Jan 2006.
- Structural shielding design and evaluation for Megavoltage x- and gamma ray Radiotherapy Facilities. NCRP report No. 151, 2005.
- <https://rpop.iaea.org/rpop/rpop/content/informationfor/healthprofessionals/>