

Course Specification

RARD 627: Physics Measurement in Diagnostic Imaging

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 627

Course name: Physics Measurement in Diagnostic Imaging

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

3. Curriculum and type of course

3.1 Curriculum: Physics Measurement in Diagnostic Imaging

3.2 Type of course: Required course

4. Instructors

4.1 Course Coordinator: Asst.Prof. Dr. Sawwanee Asaaphatiboon

4.2 Instructors:

Asst.Prof. Dr. Sawwanee Asavaphatiboon

Asst.Prof. Dr.Napapong Pongnapang

Lecturer Prapa Sodkokruad

Lecturer Patompong Polharn

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

6. Pre-requisite: Radiation and Nuclear Physics and Physic of diagnostic Imaging

7. Co – requisites: None

8. Classroom: To be announced

9. Revision Date: 31st July 2019

Note: Revised course learning outcome, course description, and evaluation

Section 2: Purpose and objective

1. Course Learning Outcomes

- 1.1 Student can explain physic measurement of diagnostic equipment
- 1.2 Student can identify the types and characteristic of dosimetry equipment
- 1.3 Student can perform the measurement of diagnostic equipment as following Technical Reports Series no. 457: Dosimetry in Diagnostic Radiology: An international code of practice, IAEA
- 1.4 Student can explain concept of image quality in each modalities of diagnostic equipment
- 1.5 Student can explain and perform quality assurance
- 1.6 Student can communicate and share the knowledge by effective presentation skill
- 1.7 Student can value the professional conduct of Diagnostic equipment

Section 3: Course details

1. Course Description

Physics measurement of diagnostic imaging, image quality, quality control and quality assurance, radiation dosimetry as following Technical Reports Series no. 457: Dosimetry in Diagnostic Radiology: An international code of practice, IAEA

2. Hours per semester:

Lecture	15 hours
On the job training	45 hours
Self-study	45 hours

3. 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 physic measurement of diagnostic equipment	ELO 2	- Lecture - Class discussion - Assigned readings	- Oral/paper Examination
2. Student can identify the types and characteristic of dosimetry equipment	ELO 1, 2, 6	- Lecture - Class discussion - Assigned readings	- Oral/paper Examination - On the job report
3. Student can perform the measurement of diagnostic equipment as following Technical Reports Series no. 457: Dosimetry in Diagnostic Radiology: An international code of practice, IAEA	ELO 2, 4, 5, 6	- Lecture - On the job training - Class discussion - Assigned readings	- Oral/paper Examination - On the job report
4. Student can explain concept of image quality in each modalities of diagnostic equipment	ELO 2, 6	- Lecture - On the job training - Class discussion - Assigned readings	- Oral/paper Examination - On the job report
5. Student can explain and perform quality assurance	ELO 2, 3, 5,6	- Lecture - On the job training - Class discussion - Assigned readings	- Oral/paper Examination - On the job report
6. Student can communicate and share the knowledge by effective presentation skill	ELO 4,5	- Class discussion - Assigned readings	- Oral/paper Examination
7. Student can value the professional conduct of Diagnostic equipment	ELO 1,2, 3, 4,6	- Assigned readings	- Rubric writing assessment

Section 5: Lesson plan and assessment

1. Lesson plan

Time(hr)	Topics	Instructors	Method	Assessment
15 min	Introduction of course	Lect.Dr.Sawwanee	- Inform	
2	Introduction of Technical Reports Series no. 457: Dosimetry in Diagnostic Radiology: An international code of practice, IAEA	Lect.Dr.Napapong	- Lecture - Class discussion	- Oral Pre test - Examination
2	Framework of Dosimetry in Diagnostic Radiology	Lect.Dr.Napapong	- Lecture - Class discussion	- Oral Pre test - Examination
2	Dosimetric quantities and units in Diagnostic Radiology	Lect.Dr.Sawwanee	- Lecture - Class discussion	- Oral Pre test - Examination
2	Selection of Instrumentation	Lect.Dr.Napapong	- Lecture - Class discussion	- Oral Pre test - Examination
1	Establishment of A Diagnostic SSDL calibration Facility Code of practice for diagnostic calibrations at SSDLS– I	Lect.Dr.Napapong	- Lecture - Class discussion	- Oral Pre test - Examination
1	Code of practice for diagnostic calibrations at SSDLS– II	Lect.Dr.Napapong	- Lecture - Class discussion	- Oral Pre test - Examination
3	Code of practice for Clinical Measurements Lab 1: Scatter measurements and radiation safety	Lect.Dr.Sawwanee Lect.Prapa	- On the job training - Class discussion	- on the job training report
1	Quality control and Dosimetry quantities in Radiography	Lect.Dr.Sawwanee	- Lecture - Class discussion	- Oral Pre test - Examination

Time(hr)	Topics	Instructors	Method	Assessment
3	Lab 2: Radiography /Digital Radiography QC and dosimetry	Lect.Dr.Sawwanee Lect.Prapa	- On the job training - Class discussion	- on the job training report
3	Lab 1: Scatter measurements and radiation safety presentation and discussion	Lect.Dr.Sawwanee Lect.Prapa	- Presentation - Class discussion	- Rubric presentation skill
1	Quality control and Dosimetry quantities in Fluoroscopy	Lect.Dr.Napapong	- Lecture - Class discussion	- Oral Pre test - Examination
3	Lab 3: Fluoroscopy QC and dosimetry	Lect.Dr.Napapong / Lect.Dr.Sawwanee Lect.Prapa	- Lecture - Class discussion	- Examination
3	Lab 2: Radiography /Digital Radiography QC and dosimetry presentation and discussion	Lect.Dr.Sawwanee Lect.Prapa	- Presentation - Class discussion	- Rubric presentation skill
1	Quality control and Dosimetry quantities in Mammography	Lect.Dr.Napapong	- Lecture - Class discussion	- Oral Pre test - Examination
3	Lab 4: Mammography QC and dosimetry	Lect.Dr.Napapong / Lect.Dr.Sawwanee Lect.Prapa	- On the job training - Class discussion	- on the job training report
3	Lab 3: Fluoroscopy QC and dosimetry presentation and discussion	Lect.Dr.Sawwanee Lect.Prapa	- Presentation - Class discussion	- Rubric presentation skill
1	Quality control and Dosimetry quantities in Computed Tomography	Lect.Dr.Napapong	- Lecture - Class discussion	- Oral Pre test - Examination

Time(hr)	Topics	Instructors	Method	Assessment
3	Lab 5: Computed Tomography QC and dosimetry	Lect.Dr.Napapong / Lect.Dr.Sawwanee Lect.Prapa	- On the job training - assigned Journal presentation - Class discussion	- on the job training report - Rubric presentation skill
3	Lab 4: Mammography QC and dosimetry presentation and discussion	Lect.Dr.Sawwanee Lect.Prapa	- Presentation - Class discussion	- Rubric presentation skill
1	Quality control in Ultrasonography	Lect.Dr.Napapong	- Lecture - Class discussion	- Oral Pre test - Examination
3	Lab 6: Ultrasonography QC	Lect.Dr.Napapong / Lect.Dr.Sawwanee Lect.Prapa	- On the job training - assigned Journal presentation - Class discussion	- on the job training report - Rubric presentation skill
3	Lab 5: Computed Tomography QC and dosimetry presentation and discussion	Lect.Dr.Sawwanee Lect.Prapa	- Presentation - Class discussion	- Rubric presentation skill
3	Lab 6: Ultrasonography QC presentation and discussion	Lect.Dr.Sawwanee Lect.Prapa	- Presentation - Class discussion	- Rubric presentation skill

2. Measurement and Evaluation of Student Achievement

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| 2.1 | Theory Examination (short, long answer questions) | 50% |
| 2.2 | On the job training report | 30% |
| 2.3 | On the job training presentation | 15% |
| 2.4 | Class discussion | 5% |

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

Technical Reports Series no. 457: Dosimetry in Diagnostic Radiology: An international code of practice, IAEA, 2007.

Bushberg JT. The essential physics of medical imaging. 2nd ed. Philadelphia: Lippincott Williams & Wilkins; 2002.

William E. Brant, Clyde A. Helms. Fundamentals of Diagnostic Radiology, Fourth Edition. Lippincott Williams & Wilkins.

Seeram E. Computed tomography: Physical principles, clinical application and quality control. Philadelphia: Saunders; 2001.

American Association of Physics in Medicine. Standardized methods for measuring diagnostic X-ray exposures, AAPM Report No. 31. New York: American Institute of Physics; 1991.

American Association of Physics in Medicine. Specification and acceptance testing of computed tomography scanners, AAPM Report No. 39. New York: American Institute of Physics; 1993.

American Association of Physics in Medicine. The role of clinical medical physicist in diagnostic radiology, AAPM Report No. 42. New York: American Institute of Physics; 1994.

American Association of Physics in Medicine. Real-time B-mode ultrasound quality control test procedures, AAPM Report No. 65. New York: Medical Physics Publishing; 2002.

American Association of Physics in Medicine. Quality control in diagnostic radiology, AAPM Report No.74. New York: American Institute of Physics; 1998.

National Council on Radiation Protection and Measurement. Quality assurance for diagnostic radiology, NCRP Report No. 99. Bethesda: NCRP; 2002.