Course Specification

RARD 511: Radiation and Nuclear Physics

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 511
   Course name: Radiation and Nuclear Physics

2. ***Credits: 2(2-0-4)***

3. ***Curriculum and type of course***

   3.1 Curriculum: Radiation and Nuclear Physics

   3.2 Type of course: Pre-Requisite

4. ***Instructors***
   4.1 Course Coordinator: Lect.Dr.PuangpenTangboonduangjit
   4.2 Instructors

Lect.Dr.Puangpen	Tangboonduangjit
Asst. Prof. Dr. Sawwanee	Asavaphatiboon
Lect. Dr. Kritsanat	Cheumsaamarkkee
Lect. Dr. Nauljun	Stansook
Lect. Dr.Suphaluck Kajornkum	

5. ***Semester/Year:*** 1st Semester, Academic Year 2020, 1styear students
6. ***Pre-requisite:*** None
7. ***Co-requisite:*** None
8. ***Classroom:*** To be announced
9. ***Revision Date:*** Nov 2019 ***By:*** Committee

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

Section 2: Purpose and objective

1. Course Learning Outcomes

1. Be able to describe, compare and classify atomic structure, interaction of radiation with matter, x-ray production, and shielding.
2. Be able to calculate radioactive activity, attenuated photons, energy of radiation through matter, range of particles, and shielding thickness.
3. Be able to relate theory of atomic structure, interaction of radiation, and shielding calculation to the field of nuclear medicine, radiation oncology, and diagnostic imaging.

Section 3: Course details

1. Course description

Atomic structure; nuclear structure, nuclear models, nuclear disintegrations, nuclear reaction; interaction of photon with matter: interaction of charged particle with matter, interaction of neutron with matter; properties and production of X-rays; principle of shielding for photon, charged particle, and neutron

2. ***Hours per semester:*** Lecture 30 hours

3. ***Assignment feedback:***Within 2 weeks

Section 4: Course Learning Outcomes

Course level learning outcomes	Programme level learning outcomes	Methods	Assessment
1.Be able to describe, compare and classify atomic structure, interaction of radiation with matter, x-ray production, and shielding.	ELOs 2	-Lecture - Class discussion - Assignment	- Paper Examination - Rubric participation assessment - Rubric assignment
2.Be able to calculate radioactive activity, attenuated photons, energy of radiation through matter, range of particles, and shielding thickness	ELO 2	- Lecture - Class discussion - Assignment	- Paper Examination - Rubric participation assessment - Rubric assignment

Course level learning outcomes	Programme level learning outcomes	Methods	Assessment
3. Be able to relate theory of atomic structure, interaction of radiation, and shielding calculation to the field of nuclear medicine, radiation therapy, and diagnostic imaging.	ELOs 2	- Lecture - Class discussion - Assignment	- Paper Examination - Rubric participation assessment - Rubric assignment

Section 5: Lesson plan and assessment

1. Lesson plan

Time (hr)	Topics	Instructors	Method	Assessment
2	Atomic structure	Lect.Dr.Suphaluck	Lecture/ Assignment	- Paper examination - Rubric assignment
2	Nuclear structure	Lect.Dr.Nualjun	Lecture/ Assignment	- Paper examination - Rubric assignment
2	Nuclear models	Lect.Dr.Nualjun	Lecture/ Assignment	- Paper examination - Rubric assignment
3	Nuclear transformations	Lect.Dr.Krisanat	Lecture/ Assignment	- Paper examination - Rubric assignment
3	Nuclear reactions	Lect.Dr.Krisanat	Lecture/ Assignment	- Paper examination - Rubric assignment
3	Charged particle interactions 1	Lect.Dr.Puangpen	Lecture/ Assignment	- Paper examination - Rubric assignment

Time (hr)	Topics	Instructors	Method	Assessment
3	Charged particle interactions 2	Lect.Dr.Puangpen	Lecture/ Assignment	- Paper examination - Rubric assignment
3	EM interactions 1	Lect.Dr.Puangpen	Lecture/ Assignment	- Paper examination - Rubric assignment
3	EM interactions 2	Lect.Dr.Puangpen	Lecture/ Assignment	- Paper examination - Rubric assignment
2	Neutron interaction	Asst.Prof.Dr.Sawwanee	Lecture/ Assignment	- Paperexamination - Rubric assignment
2	X-ray	Asst.Prof.Dr.Sawwanee	Lecture/ Assignment	- Paper examination - Rubric assignment
2	Shielding	Asst.Prof.Dr.Sawwanee	Lecture/ Assignment	- Paper examination - Rubric assignment

2. Measurement and Evaluation of Student Achievement

2.1 Theory (short answer questions) 70%
2.2 Writing assignment 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

1. Philip Mayles, Alan Nahum, Jean-Claude Rosenwald. Handbook of radiotherapy physics therory and practice: Talor & Francis Group; 2007.
2. James E. Turner. Atoms, radiation, and radiation protection: Wiley-VCH 3rd ed; 2007.
3. Pedro Andreo, Davis T.Burns, Alan E. Nahum, Jan Seuntjens, and Frank H. Attix. Fundamentals of ionizing radiation dosimetry: Wiley-VCH; 2017.