Course Specification

RARD 631: Radiobiology in Radiotherapy

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 631
   Course name: Radiobiology in Radiotherapy

2. ***Credits: 1(1-0-2)***

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

   3.1 Curriculum: Radiobiology in Radiotherapy

   3.2 Type of course: Major course of Radiation Therapy field

4. ***Instructors***
   4.1 Course Coordinator: Lect.Dr.Puangpen Tangboonduangjit
   4.2 Instructors
   Assoc.Prof.Dr.Vipa Boonkitticharoen

5. ***Semester/Year:*** 1st Semester, Academic Year 2020, 2nd year students
6. ***Pre-requisite:*** RARD 528 Basic and radiological imaging of anatomy and Physiology
   RARD 520 Radiation Biology
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***
   1.1 Apply the role of radiation biology to the clinical application to radiation oncology in depth.

Section 3: Course details

1. ***Course description***
   Overview application of radiobiological principles in radiotherapy,BED and EQD2, TCP and NTCP, the volume effect, oxygen effect, hypoxia, LET and RBE, combined radiotherapy and chemotherapy, retreatment tolerance of normal tissues, tumor growth and response to irradiation, the dose-rate effect, particle in radiotherapyRadiation-induced malignancies
2. ***Hours per semester:*** Lecture 15 hours
3. ***Assignment feedback:***Within 2 weeks

Section 4: Course Learning Outcomes

Course level learning outcomes	Programme level learning outcomes	Methods	Assessment
Apply the role of radiation biology to the clinical application to radiation oncology in depth.	ELO 2, 5, 6	-Lecture	- Paper Examination - Rubric presentation assessment

Section 5: Lesson plan and assessment

1. Lesson plan

Time (hr)	Topics	Instructors	Method	Assessment
1	Overview application of radiobiological principles in radiotherapy	Assoc.Prof.Dr.Vipa Boonkitticharoen	Lecture	Paper exam
1	BED and EQD_2	Assoc.Prof.Dr.Vipa Boonkitticharoen	Lecture	Paper exam
1	TCP and NTCP	Assoc.Prof.Dr.Vipa Boonkitticharoen	Lecture	Paper exam
2	- The volume effect - Oxygen effect, hypoxia - LET and RBE	Assoc.Prof.Dr.Vipa Boonkitticharoen	Lecture	Paper exam
2	Combined radiotherapy and chemotherapy	Assoc.Prof.Dr.Vipa Boonkitticharoen	Lecture	Paper exam
2	Retreatment tolerance of normal tissues	Assoc.Prof.Dr.Vipa Boonkitticharoen	Lecture	Paper exam
1	Tumor growth and response to irradiation	Assoc.Prof.Dr.Vipa Boonkitticharoen	Lecture	Paper exam
1	The dose-rate effect	Assoc.Prof.Dr.Vipa Boonkitticharoen	Lecture	Paper exam
2	Particle in radiotherapy	Assoc.Prof.Dr.Vipa Boonkitticharoen	Lecture	Paper exam
2	Radiation-induced malignancies	Assoc.Prof.Dr.Vipa Boonkitticharoen	Lecture	Paper exam
	Group presentation	Assoc.Prof.Dr.Vipa Boonkitticharoen	Student Presentation	Rubric presentation assessment

2. Measurement and Evaluation of Student Achievement

2.1	Theory (short answer questions)	70%
2.2	Presentation	20%
2.3	Behavior/Discipline	10%

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. Lodish H. Molecular Cell Biology. 6th ed. New York : WH Freeman ; 2008
2. Schoen wolf GC, Bleyl SB, Breuer PR, Francis-West PH. Larsen's Human Embryology. 4th ed. Philadelphia : Churchill Livingstone; 2009.
3. Gilkert SF. Developmental Biology. 9th ed. Massachusetts : Sinauer Associates, Inc. ; 2010
4. Joiner M, Van der Kogel A. Basic Clinical Radiobiology. 4th ed. Landon : Edword Arnold
5. Hall EJ, Giaecia AJ. Radiobiology for the Radiologist. 6th ed. Philadephia : Lippincott Williams & Wilkins; 2006.
6. Halperin EC, Perez CA, Brady LW. Priniciples and Practice of Radiation Oncology. 5th ed. Philadelphia : Lippincott Williams & Wilkins; 2008.
7. Gunderson LL, Tepper JE. Clinical Radiation Oncology. 2nd ed. Philadelphia : Churchil Livingstone
8. ESTRO course in Radiobiology 2017