Course Specification

RARD 628: Advanced Techniques for 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 628
   Course name: Advanced Techniques for Radiotherapy

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

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

   3.1 Curriculum: Advanced Techniques for Radiotherapy

   3.2 Type of course: Major course for Radiation Therapy field

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

Lect.Dr. Puangpen	Tangboonduangjit
Lect.Dr. Nauljun	Stansook
Lect.Dr.Suphalak	Khachonkham
Lect. Pimolpun	Changkaew
Lect. Daranee	Piriyasang
Lect. Supaporn	Srisuwan
Lect. Sukanya	Rutchantuek
Lect. Siwaporn	Sakulsingharoj
Lect. Pornpan	Yongvititsatit
Lect. Chanida	Vutiprasertpong
Lect. Sithiphong	Suphaphong
Assist.Prof.Dr.Somboon	Rassame

5. ***Semester/Year:*** 1st Semester, Academic Year 2020, 2nd year students
6. ***Pre-requisite:*** RARD 524: Physics of Radiation Therapy
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 comprehend the concept of treatment planning system.
2. Be able to describe, compare and analyse the advanced techniques in radiotherapy namely intensity modulated radiotherapy, volumetric modulated arc therapy, stereotactic therapy, total body irradiation, total skin electron irradiation, particle (ion beam) therapy, small field dosimetry, 3D brachytherapy, and Monte Carlo simulation calculation.
3. Be able to communicate and share the knowledge by effective presentation skill
4. Be able to value the professional conduct of advance techniques for radiation therapy

Section 3: Course details

1. Course description

The concept of treatment planning system, intensity modulated radiotherapy (IMRT), volumetric modulated arch therapy (VMAT), stereotactic body radiotherapy (SBRT) and motion management; small field dosimetry; image registration and image guided radiotherapy (IGRT); professional conduct (quality management in RT); treatment planning techniques for 3D brachytherapy; total body irradiation (TBI) and total skin electron irradiation (TSEI); particle therapy and Monte Carlo simulation calculation.

2. ***Hours per semester:*** Lecture 15 hours
   Demonstration 9 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 comprehend the concept of treatment planning system.	ELO 2, 6	- Lecture - Demonstration	- Paper/oral Examination
2. Be able to describe, compare and analyse the advanced techniques in radiotherapy namely intensity modulated radiotherapy, volumetric modulated arc therapy, stereotactic therapy, total body irradiation, total skin electron irradiation, particle (ion beam) therapy, small field dosimetry, 3D brachytherapy, and Monte Carlo simulation calculation.	ELO 2, 6	- Lecture - Assignment - Demonstration	- Paper/oral Examination - Assignment report
3. Be able to communicate and share the knowledge by effective presentation skill	ELOs 2, 5, 6	Assigned journal readings	Rubric presentation skill assessment
4. Be able to value the professional conduct of advance techniques for radiation therapy	ELO 1, 2, 6	Assigned journal readings	Rubric presentation skill assessment

Section 5: Lesson plan and assessment

1. Lesson plan

Time	Topics	Instructors	Method	Assessment
1	1. Introduction/ Radiation techniques (2D/3D)	Dr.Suphalak	Lecture	Paper examination
2	2. Radiation techniques (IMRT/VMAT)	Dr.Nauljun	Lecture	Paper examination
2	Lab 1. TPS intro	A.Pimolpun/ Dr. Suphalak	Demonstration	Paper examination
2	3. SRS/SRT/SBRT and motion management	A.Pornpan	Lecture	Paper examination
2	Lab 2. Target tracking	A.Pornpan/ A.Kumutini	Demonstration	Paper examination
1	4. Image registration/ Demon	Dr.Nauljun/ A.Sitthipong	Lecture	Paper examination
2	Lab 3. TPS 2D/3D	A.Chanida/ A.Supaporn	Demonstration	Paper examination
2	Lab 4. TPS IMRT/VMAT	A.Supaporn/ Dr.Nauljun	Demonstration	Paper examination
1	5. 3D Brachytherapy	A.Daranee/ A.Supakiat	Lecture	Paper examination
2	6. TBI (QA)/TSEI	A.Supaporn	Lecture	Paper examination
2	7. Small field dosimetry (TRS483)	Dr.Puangpen	Lecture	Paper/Oral examination
1	8. Quality management in RT	Dr.Puangpen	Lecture	Paper/Oral examination
3	Lab 5. TRS483	A.Supakiat/ A. Pimolpun/ Dr.Suphalak	Demonstration	Paper/Oral examination
1	9. Ion beam	Dr.Suphalak	Lecture	Paper examination
3	Monte Carlo Simulation : MCNP code applied in medicine	Dr.Somboon	- Lecture - Demonstration	Rubric experiment report
	Students Journal presentations	Lect.Dr.Puangpen	Assigned journal readings	Rubric presentation skill

2. Measurement and Evaluation of Student Achievement

2.1	Paper (short answer questions)	60%
2.2	Oral exam	15%
2.3	Journal presentation	15%
2.4	Writing assignment	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. Philip Mayles, Alan Nahum, Jean-Claude Rosenwald. Handbook of radiotherapy physics therory and practice: Talor & Francis Group; 2007
2. Faiz M. Khan. The Physics of Radiation Therapy: Lippincott Williams & Wilkins, a Wolters Kluwer business, 4th edition; 2010
3. Hendee WR, Ibbott GS. Radiation therapy physics, 2nd ed. New Jersey: Wiley-Liss; 2005.
4. Van Dyk J. The modern technology of radiation oncology :a compendium for medical physicists and radiation oncologist.Wisconsin : Medical Physics Publishing; 1999.
5. International Commission on Radiation Units and Measurements. Prescribing, recording and reporting Photon beam therapy (supplement to ICRU Report 50), ICRU Report 62. Bethesda : ICRU; 1999.
6. Glasgow GP, Bourland JD, Grigsby PW, et al. Remote afterloading technology : a report of AAPM task group No.41. New York: American Institute of Physics; 1993.
7. GoddenTJ. physical aspects of brachytherapy, Medical Physics Handbooks 19. Philadelphia: IOP Publishing; 1988

8. International Atomic Energy Agency. The use of plane parallel ionization chambers in high energy electron and photon beams : An international code of practice for dosimetry, Technical Reports Series No. 81. Vienna : International Atomic Energy Agency; 1996.

9. Kubo DH, Glasyow GP, Pethel TD, Thomadsen BR, Williamson JF. High dose- rate brachytherapy treatment delivery: Report of the AAPM Radiation Therapy Committee task group No. 59. Med Phys 1998; 25: 375-403.

10. Fraass B, Doppke K, Hunt M, Kutcher G, Starkschall G, Stern R, van Dyke J. Quality assurance for clinical radiotherapy treatment planning. Med Phys 1998; 25: 1773 – 1829.

11. Constantinou C. Protocol and procedures for quality assurance of linear accelerators. Brockton : Radiation Oncology Department Brockton Hospital; 1993.

12. American Association of Physics in Medicine. Comprehensive QA for radiation oncology: report of AAPM Radiation Therapy Committee task group 40, Med Phys 1994; 21: 581–618.

13. IAEA. Technical report series no.483 Dosimetry of small static fields used in external beam radiotherapy; 2017.