



Department of Physics
College of Science
University of Salahaddin

Physics of Radiation Therapy (I)

Course Book – (4th Year Physics– Applied Branch)

Lecturer's name *MSc Hemn Azeez Rahman*

Academic Year: 2018/2019

11. Course objective:

At the end of the course the student will:

1. Have an understanding of the radiation units and quantities
2. Have a grasp of the treatments option of cancer.
3. Be familiar with the types of radiotherapy, both external and internal.
4. Be familiar with the types of radiotherapy machines
5. Be aware of the way that a LINAC works
6. Have a grasp of the interactions between megavoltage electron and photon with human tissue or tissue equivalent materials
7. Have a general understanding of the simulators and the CT simulators
8. Have an appreciation of image reconstruction using computed tomography
9. Have an appreciation of the theoretical description of imaging systems and the virtual simulations with the TPSs.
10. Appreciate the role of the medical physicist in the management of medical imaging systems, safety aspects and quality assurance.
11. Understand what is brachytherapy and its applications

12. Student's obligation

Normally, students obliged to attend all the lectures and take notes during the lecture. In addition, in class participation would be a bonus of the students to widen their knowledge and understand the module thoroughly.

Attending the lectures regularly would be a crucial point for the students to consider, because the module is very new and very detailed. If the students missed few lectures, they would have difficulty to get back on the track.

Additionally, students are ought to submit and their home works and assignments given by their lecturer, because there would be penalties for the late submission. All exams and tests done with books closed, and, students have to take at least one compulsory exams with few class test and quizzes during the years of study. Finally, the students must regularly visit the teachers' website (<http://hemnphy.weebly.com>) to keep up with all news and the exam date of the class.

13. Forms of teaching

I am using few unusual ways to make the students engage with the lecture. As the module is very details, using data shows and powering slides would not be enough, so I used the white board too. If there were slides that needed more explanation the rest, or, if the slide needed a long, explanation and I thought that the students must know all of that, I would distribute the printed out version of the description on the students to widen their knowledge on the subject.

I have also built a specific website for the students to find the lectures and download the lectures the in advance of the lecture. Sometimes I use the technique of Problem Based Learning (PBL).

14. Assessment scheme

2x Two hour written examination	35 %
Class Test	5 %
Final examination	60 %

15. Student learning outcome:

Students who took the module of Radiotherapy Physics would easily be able to find a job in the therapeutic department in the oncology centers. The students would be taught the process of radiotherapy, and what happens to the patient from the consultation time till the follow up process. The students can also work in the Linear accelerator facility and the operator, and medical physicist and some time as a QA checker.

16. Course Reading List and References:

The main text books are:

Mayles, Philip, Alan Nahum, and Jean-Claude Rosenwald, eds. Handbook of radiotherapy physics: theory and practice. CRC Press, 2007.

Podgorsak, E. B. "Radiation oncology physics: A handbook for teachers and students." (2005).

17. The Topics:	Lecturer's name
Radiation quantities and unites	MSc Hemn A. Rahman Week one Length: 2 hours
Introduction of Radiotherapy (I)	MSc Hemn A. Rahman Week two Length: 2 hours
Introduction of Radiotherapy (II)	MSc Hemn A. Rahman Week Three Length: 2 hours
Treatment machines for EBRT	MSc Hemn A. Rahman Week Four Length: 2 hours
Linear accelerator (I)	MSc Hemn A. Rahman Week Five Length: 2 hours
Linear accelerator (II)	MSc Hemn A. Rahman Week Six Length: 2 hours
Linear accelerator (III)	MSc Hemn A. Rahman Week Seven Length: 2 hours
Physical aspects of external photon beam	MSc Hemn A. Rahman Week Eight Length: 2 hours
Physical aspects of external Electron beam	MSc Hemn A. Rahman Week Nine Length: 2 hours
Radiotherapy treatment planning system TPS (I)	MSc Hemn A. Rahman Week Ten Length: 2 hours
Radiotherapy treatment planning system TPS (II)	MSc Hemn A. Rahman Week Eleven Length: 2 hours
Quality Assurance of External Beam Radiotherapy (I)	MSc Hemn A. Rahman Week Twelve Length: 2 hours

Quality Assurance of External Beam Radiotherapy (II)	MSc Hemn A. Rahman Week Thirteen Length: 2 hours
Brachytherapy (If there were enough time)	MSc Hemn A. Rahman Week Fourteen Length: 2 hours
18. Practical Topics (If there is any)	N/A
<p>19. Examinations:</p> <p>A sample:</p> <p>Q1. Circle the correct answer: (5.0 Marks)</p> <p>(Note: Any two incorrect answer will cancel a correct one)</p> <p>1. What makes the difference between electrostatic and cyclic accelerators ?</p> <p>A. The way they accelerate particles B. The types of particles is being accelerated C. The amount energy that the accelerated particle can have. D. The strength of the field used to accelerate the particles.</p> <p>2. An electron beam can not be produced in ----- Linacs.</p> <p>A. High energy B. Low energy C. Moderate energy D. Low & Moderate energy</p> <p>3. Diode and triode type electron guns are different such that the diode electron gun-----</p> <p>-----.</p> <p>A. Have a grid B. Does not have a grid C. Dose not have heated filament cathod D. Does not have a perforated grounded anode</p> <p>4. In traveling wave waveguides, electron acceleration occurs in any ----- cavity.</p> <p>A. 1 in 2 B. 1 in 3 C. 1 in 4 D. 1 in 5</p> <p>5. Water colling system, which is a part of auxilary system of Linac, used to cool down --</p> <p>-----.</p> <p>A. Waveguide only B. Target only C. Target and waveguide D. beam transport system only</p>	

Q2. Answer the following quations:

1. If a traveling wave accelerating waveguide which has a length of (L) and accelerates electrons to kinetic energy of (E) has been replaced with a standing wave accelerating waveguide. What would happen to the the length of the WG if we wanted to have the same electron beam energy ? How and why ? (3.0 Marks)

2. What is the function of the following parts of Auxillary system of a Linac ?

A. Vaucm pumping system (1.0 Marks)

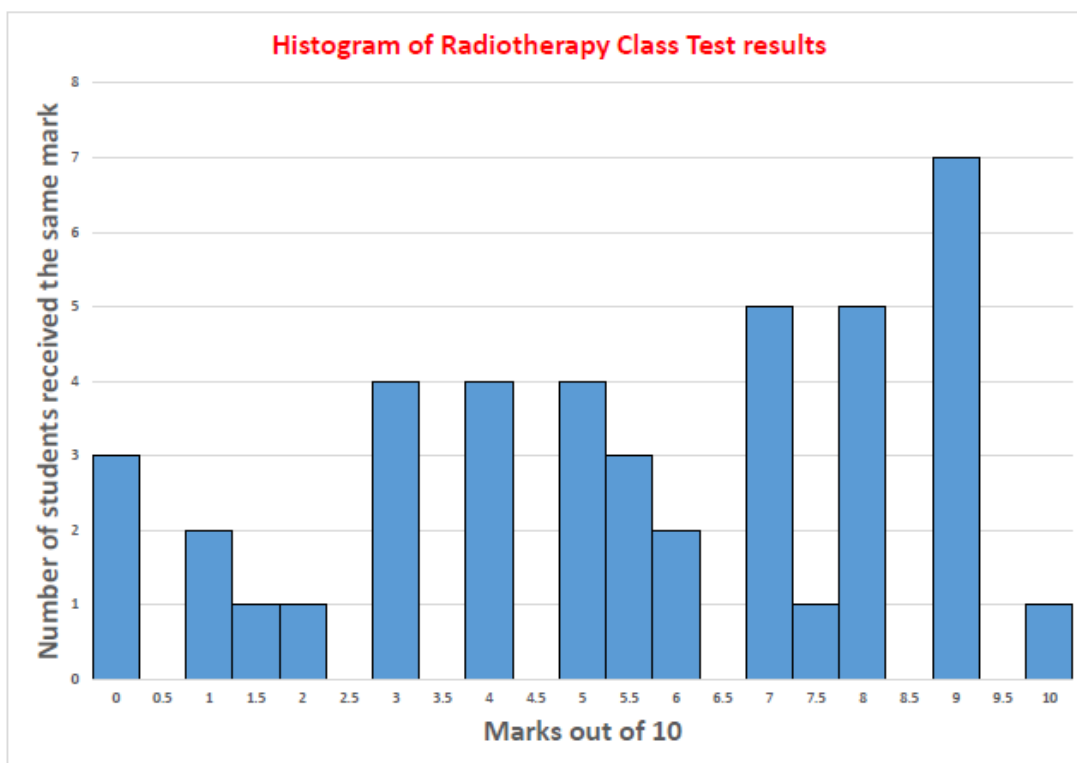
B. Sheilding materials (1.0 Marks)

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20. Extra notes:

In addition to receiving their marks on the exam papers, students also receive the histogram of the marks, which give an idea on how well the rest of the students performed in the exam. That help the students to find his place between his friends without anyone knows the mark of the other.

Here an example of the Histogram:



The results can be found in this link: <https://hemnphy.weebly.com/results.html>

21. Peer review

I am MSc Khdr H.Hussien, I confirm that I reviewed Hemn's course content and course book structure. I found his work very interesting; I think students will be lucky to have this kind of module in their BSc degree. I had few suggestions of the works, and he warmly welcomed my suggestions. Hope him all the best.