Medical Physics 661

RADIOTHERAPY RAD LAB:
A Laboratory Course

Instructor: Bruce Thomadsen

2 credits - approximately 32 contact hours
(individually tailored to each student)

Offered: Fall semesters only

Texts:

- Perez and Brady *Principles and Practice of Radiation Oncology*
- DeVitta, Hellman, Rosenberg *CANCER: Principles and Practice in Oncology*
- American Association of Physicists in Medicine "AAPM's TG-51 Report: Protocol for clinical reference dosimetry of high-energy photon and electron beams" *Medical Physics* **26**: 1847-1870 (1999)
- American Association of Physicists in Medicine "AAPM's TG 45 Report: Code of Practice for Radiotherapy Accelerators" *Medical Physic* **21**: 1093-1121 (1994)
- American Association of Physicists in Medicine "AAPM's TG 40 Report: Comprehensive QA for Radiation Oncology" *Medical Physic* **21**: 581 - 618 (1994)
- TG 142 Report: Quality assurance of medical accelerators. *Medical Physics* **36**: 4197-4212 (2007)

Student evaluation:	Lab report #1	50%
	Lab report #2	50%

See attached handouts for a description of the laboratory exercises and class expectations.

RADIOTHERAPY RAD LAB NOTES

1. These rad labs provide an opportunity for the independent practice of skills one would use in a radiotherapy clinic. The familiarity with equipment should have been gained in Medical Physics 566 lab. These labs are where any mistakes you might make should be made, before you have to do any of this professionally. To allow the student to think out and plan required activities, I tell only the basic situation. The student should feel free to ask any questions, and to describe measurements, which will be taken beforehand, to prevent major omissions and misunderstandings.

2. Working in pairs allows students to discuss problems and gain a better understanding of the situations. Working in triplets tends to decrease exposure to critical activities, but is allowed. Working alone can lead to a great deal of frustration.

3. The grading for these labs is based on the following criteria:

Grade	Description of Work
A.	Effort above and beyond that required performed; work essentially correct, was prepared for laboratory time, report written clearly, concisely and properly.
A/B.	Required work performed; work correct, mostly prepared for laboratory, report written clearly, concisely and properly.
B.	Required work performed minimally; work essentially correct, some preparation lacking, report written less than clearly, concisely and properly.
C.	Omissions in work performed and/or errors in the work and/or lack of preparation and/or less than adequate writing in the report.
D.	Major omissions, errors or writing problems.
E.	Established by extrapolation from the above.

4. Each of the two labs requires a separate report, and each participant must generate a report independently.

5. The labs may be performed in either order. The first report (on any of the labs) is due the eighth week of class, and the second during the fourteenth week. Departures from this schedule result in lowering grades; just as in the real world situations that these labs simulate, missing deadlines yields untoward consequences. Requests for exceptions must be discussed with the instructor at least two weeks prior to a deadline. Only one report per student will be corrected during the last week of classes under any circumstances.

6. Working on the treatment units requires the presence of someone certified on the unit.

7. Discuss with the instructor your plans before you do any significant work. When you come to work in the clinic, it is expected that you will be prepared to perform your work. Lack of planning that wastes time will lower grades.

If you desire credit towards these red labs from work performed on a practicum, arrangements must be made prior to the practicum.

Radiotherapy Rad Lab
Annual Accelerator Testing

Object: To perform the routine annual tests for a linear accelerator as you would were you consulting for an institution.

Method:

1. Read the AAPM reports listed above.

2. Decide what information should be transmitted to the institution in your report, and then what data you must take. Decide on what equipment you will need, and what factors you will use.

3. Discuss your intentions with the instructor.

4. Make sure you know how to operate any equipment you will use.

5. Make the measurements on the accelerator.

Caution: The treatment units and dosimetry instrumentation can be deadly, and easily damaged by ignorant users. Do not touch without proper instruction.

Conclusion: Report your findings as you would to the institution, i.e., a letter to the radiation oncologist at the facility. The body of the report should be *very brief*. You should include:

1. Evaluation of all alignment information necessary for treatments.

2. Evaluation of all dosimetry information necessary for treatments.

3. Estimates, with rationales, of your uncertainties.

4. Your data as an appendix.

Radiotherapy Rad Lab
Clinical Dosimetry Problems

Object: Analyze the techniques used in treatments involving one of the following diseases or problems, or site of your choosing:

1. Chronic lymphocytic leukemia
2. Myeloma (widespread)
3. Hodgkin's disease
4. Cancer of the Lung
5. Meduloblastoma with gross disease extending the length of the spinal canal
6. Cancer of the Bladder or Prostate
7. Cancer of the Cervix or Endometrium
8. Cancer of the Head and Neck
9. Cancer of the Skin
10. Stage III Cancer of the Ovary

Method: Clarity and completeness are essential.

1. Read about treatment of the disease you have selected in texts listed, or other standard texts:
   DeVita, Hellman and Rosenber. *Cancer: Principles and Practice of Oncology*, Perez and Brady: *Principles and Practice of Radiation Oncology*

2. Discuss with the instructor how this treatment how it is handled at the University of Wisconsin.

3. Obtain a CT image set of the Rando Phantom, and using the computer try to compare the dose distributions due to various techniques to obtain the optimum distribution.

4. Using film dosimetry (or other methods if more relevant), verify the dose distribution calculated by the computer.

5. *Quantify* the agreement between your experimental measurements and the computer projected plan.

Conclusions: Your report considers the accuracy with which you can plan and/or verify dose distributions. The Analysis should include:

1. Data (computer output, dosimetric measurements, etc.) to support your conclusion. One copy per team suffices.

2. Discussion of problems with the current treatment techniques and proposed improvements.