Clinical Rotation 1: PHYS 701  
COURSE INFORMATION

Class Days: Monday-Friday  
Class Times: Forty hours per week  
Class Location: One of the participating cancer clinics

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Office Hours Times (and by appointment): 3:00-4:00  
Office Hours Location: P-139

Associate Program Directors at Participating Sites:

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Course Overview

Description from the Official Course Catalog:
On-site, full-day clinical training in external beam modalities (Megavoltage photons, electrons, superficial x-rays) including equipment selection, radiation protection, acceptance/commissioning, calibration and quality assurance. Theoretical basis and use of the various detectors and dosimeters associated with external beam modalities

Description of the Purpose and Course Content:
This course is a clinical rotation that comprises an integral part of the residency training for radiation oncology physics. It is designed to be in accordance with American Association of Physicists in Medicine Report 90, 'Essential and Guidelines for Hospital based Medical Physics Residency Training Programs', and the Commission on Accreditation of Medical Physics Educational Programs (CAMPEP).

This course extends over the first six months of the certificate program and consists of rotations through areas of external beam radiation therapy physics under the supervision of Board Certified Medical Physicists at one of the participating cancer centers. The course also includes assigned reading on the various aspects of external beam radiation therapy and ethics and professionalism. Objectives are established at the commencement of the course. The Resident will be assigned to one of the participating centers for this 6-month course. The total hours at the clinic, including self-study of reading material and contact hours of the Resident with the clinic team (i.e., Medical Physicists, Dosimetrists, Radiation Oncologists, Radiation Therapists) and chart rounds/tumor board meetings will be 40 hrs./week.
The course requires access to external beam radiotherapy equipment, which will include a megavoltage radiotherapy unit (e.g., LINAC, tomotherapy unit, cyberknife, etc.) and possibly a superficial/orthovoltage unit. Arrangements will be made to have board certified Clinical Medical Physicists at the hospitals train the Resident in all aspects of the physics of external beam radiation therapy including equipment usage and quality assurance and control. Once trained, the Resident will be expected to perform routine quality control of the equipment available at the assigned cancer center under the supervision of a qualified Medical Physicist.

I. Megavoltage (MV) photons and electrons (linear accelerators, tomotherapy unit, cyberknife), kilovoltage, and/or superficial x-rays. Note: The clinical site will have at least one type of x-ray therapy unit for hands on QC training and activities. Hands on QC training and activities on the other types of x-ray therapy units not available at the Resident’s current clinical site will occur during subsequent 6 Month rotations at the other clinical sites that have the equipment.

A. Equipment Selection (Refs. 1 & 2) – 3 Weeks
   1. Clinical radiation equipment and how it works
   2. Performance specification
   3. Feature comparison
   4. Mechanical/architectural considerations
   5. Performance test design

B. Protection (Refs. 1 & 2) – 4 Weeks
   1. Room design and shielding calculations
   2. Licensing by Nuclear Regulatory Commission (NRC) and/or state
   3. Construction supervision and site planning
   4. Radiation survey; including low energy (4–6 MV) and high-energy (15–25 MV) units.

C. Acceptance/commissioning (Refs. 1 & 2) – 4 Weeks
   1. Mechanical, safety, and radiation tests
   2. Treatment planning data

D. Calibration – 4 Weeks
   1. Instrumentation and phantoms
   2. Photons (protocols: AAPM TG 51, TG 61)

E. Quality Assurance Activities (Refs. 1 & 2) – Ongoing
   1. Daily
   2. Weekly and/or monthly
   3. Annual
   4. Recommendations (AAPM TG 40)

II. Detectors and dosimeters associated with external beam modalities – 2 Weeks:
   A. Ionization chambers:
      1. Cylindrical
      2. Parallel-plate
   B. TLD.
   C. Diodes.
   D. Film (silver bromide, radio chromic).
   E. MOSFET detectors.

III. Ethics and professionalism (Refs. 8, 9, and 10) – 2 Weeks
    The topics below will be covered by the resident through the online modules. The resident will complete the modules and associated tests available on the following website:
    
    http://www.aapm.org/education/onlinemodules.asp
Results of the tests will be submitted to the Program Director and Supervising Medical Physicist.

Attributes of Professions and Professionalism.
Physician/Patient/Colleague Relationships.
Personal Behavior and Employee Relationships.
Conflicts of Interest.
Ethics of Research.
Human Subjects Research.
Research with Animals.
Relationships with Vendors.
Publication Ethics.
Ethics of Education: Teacher and student.

Residents are also expected to read the Professional, Educational, and Science Policies on the AAPM website: http://www.aapm.org/org/policies/policy.asp?type=PP, and attend the Medical Physics Seminars on Leadership.

IV. Introduction to Treatment Planning and Special Projects (Ref. 1) – 4 Weeks
A. Introductory knowledge and hands on experience in clinical treatment planning for external beam radiotherapy. Residents are expected to know basic anatomy.
B. Special clinical projects related to external beam radiotherapy.

Student Learning Outcomes:
All of the outcomes below will be assessed by competencies in clinical measurements and practice, oral evaluations (online evaluation for “Ethics and Professionalism”), written reports and a final oral exam.

I. The following aspects of external beam modalities (Megavoltage photons, electrons, orthovoltage and/or superficial x-rays):
A. Selection of equipment
Outcome: Resident will gain practical knowledge in assessing clinical need of equipment, compare equipment specifications from different vendors, and choose equipment that meets the needs of the clinic.
B. Radiation protection
Outcome: Resident will be able to perform and describe external beam x-ray room shielding and design.
C. Acceptance/commissioning of equipment
Outcome: Resident will be able to perform and describe acceptance testing and commissioning of equipment.
D. Calibration of equipment
Outcome: Resident will be able to calibrate equipment for clinical use.
E. Quality assurance of equipment
Outcome: Resident will be able to perform routine quality assurance of equipment and know the rational for all the tests performed.

II. Detectors and dosimeters associated with external beam modalities:
Outcome: Resident will be able to use and describe the theoretical basis of the various detectors and dosimeters used for external beam radiotherapy.

III. Ethics and Professionalism:
Outcome: Resident will learn the importance of and be expected to abide by the standards of integrity, professionalism, and patient confidentiality in the practice of Clinical Medical Physics.

IV. Introduction to Treatment Planning and Special Projects (Ref. 1)
Outcome: Resident will gain introductory knowledge and hands on experience in clinical treatment planning for external beam radiotherapy. Residents will also learn how to investigate external beam radiation oncology physics questions.

Real Life Relevance:
This clinical rotation course provides practical hands on clinical training in radiation oncology physics.
Relation to Other Courses:
This is the first clinical rotation course in the Advanced Certificate of Medical Physics Residency Program. The topics covered in this and the other clinical rotations are core requirements for the Commission on Accreditation of Medical Physics Education Programs (CAMPEP).

Enrollment Information

Prerequisites:
The prerequisite for this course will be admission into the Medical Physics Residency Program at SDSU, which requires an M.S. or Ph.D. degree from a CAMPEP accredited Medical Physics Program including courses equivalent to the following. Physics 560, 565, 567, 670A, 670B, 672A, 672B.

Adding/Dropping Procedures:
The course must be added before the end of the second week of the semester. Dropping procedures will follow the Physics Department guidelines.

Course Materials

Required & Recommended Materials:
The following task group publications available at [http://www.aapm.org/pubs/reports/](http://www.aapm.org/pubs/reports/) from the American Association of Physicists in Medicine (AAPM) and books and will be the references for the course:


Course Structure and Conduct

Style of the Clinical Rotation:
- Residents will be trained by the Certified Clinical Medical Physicist to perform hands-on clinical duties in the cancer center.
- Once trained, the residents will gain practice by performing routine clinical duties.
- Residents will be responsible for learning the recommended reference materials on their own.

Course Assessment and Grading

Grading Scale:
The Resident’s performance will be evaluated by direct observation, project/progress reports, and three oral evaluations (approximately bimonthly) administered by the supervising Medical Physicist. Note: The final oral examination is cumulative and will be administered by the Advisory Committee.

One of the writing components of this course will include a report by the resident that describes all of the clinical activities/projects in which they participated. The report will include the objectives and relevance, description, methods, and discussion/conclusions of each major clinical activity/project. Special assigned clinical project reports may also be included.

The final assessment breaks down as follows:
1. Observation of clinical measurements and practice by supervising Medical Physicist: 10%
2. Bimonthly oral evaluations based on the clinical rotation topics (Approximately ranging from 20 minutes to 1 hour long): 40%
3. Project/progress and reports: 20%
4. Final presentation and oral exam (1 hour): 30%

The following evaluation scheme from 1 to 5 will be used:
1. Unsatisfactory
   - Performance and/or consistency is below standard in most/all areas covered by evaluation
   - Immediate and consistent improvement to “Meets Expectations” rating is required in next evaluation and final oral exam
2. Needs Improvement
   - Performance and/or consistency is below standards in certain areas and improvement is needed
3. Meets Expectations
   - Competent level of performance that consistently meets high standards
4. Above Expectations
   - Examination results exceed expectations
   - Performance is consistently high quality
5. Outstanding
   - Knowledge of evaluation material is exceptional and consistently superior

The resident will be assigned a pass/fail for the course. An overall score of 3 or greater constitutes a pass. If the resident fails one section of the rotation, they will be given one chance to prepare and re-take the oral exam for that section two weeks later. A copy of all evaluations will be sent to the Program Director.

Excused Absence Make-up Policies:
Students should have an extraordinary reason (e.g., illness, death in the family, etc.), with proof, to miss the oral examination or final oral examination. A make-up for such a case will be arranged with the Advisory Committee

Other Course Policies

The residents are expected to:
- Engage with supervising Medical Physicist for training.
- Record daily activities and time spent in the clinic. This will be reviewed by regularly the supervising Medical Physicist and quarterly by the Advisory Committee.
- Report for duties at the clinic and meetings on time.
- Perform assigned readings, presentations, lectures, and clinical duties in a timely manner.
- Report any QC results that are out of tolerance to the supervising or other qualified Medical Physicist at the clinic as soon as possible.
- Hand in project and progress reports by assigned deadline.
- Dress appropriately in the clinic (e.g., dress shirt and dress pants).
- Interact respectfully with all staff members and patients in the clinic.
- Advise the supervising Medical Physicist and Program Director of planned absences (e.g., vacation time or sick leave).
- A record of vacation days absent shall be kept by the Associate/Program Director and should not exceed the allotted two weeks per six-month semester. In addition, the holidays allotted to Medical Physicists at the center are applicable to the resident. The resident may also take up to 1.5 days of personal leave per six-month rotation.

**Note:**
A senior resident will be chosen to be part of the Advisory Committee to provide input on resident issues and concerns.

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that I cannot provide accommodations based upon disability until I have received an accommodation letter from Student Disability Services. Your cooperation is appreciated.