

## Medical Dosimetry

### COLLEGE OF APPLIED SCIENCES AND ARTS

#### Graduate Faculty:

**Collins, Kevin Scott**, Professor, Ph.D., Southern Illinois University Carbondale, 2011.

**Collins, Sandra K.**, Associate Professor, Ph.D., Southern Illinois University Carbondale, 2003; 2000. Health care management.

**McKinnies, Richard**, Associate Professor, M.S., Southern Illinois University Carbondale, 2000, 2003.

**Mobile, Katherine**, Lecturer, M.S., University of Wisconsin-LaCrosse, 2011.

Other related dosimetry courses are taught by medical physicists on contract.

#### TRACK 1

**Mission:** The mission of the Medical Dosimetry Program offered by Southern Illinois University (SIU) is to provide a quality program integrating education, research and service in order to meet the needs of the profession and improve health care of the people and communities we serve.

#### Program Goals

1. Prepare the student to practice as a competent entry level professional Medical Dosimetrist by offering a comprehensive curriculum and quality didactic/clinical instruction.
2. Provide didactic and clinical experiences that lead to research in educational, professional, or health care issues relating to medical dosimetry.
3. Provide avenues to students for professional development and growth within the profession.
4. Provide avenues for students to develop and apply skills in effective communication necessary for successful medical dosimetry practice.
5. Provide avenues for students to develop and apply skills in critical thinking and problem-solving necessary for successful medical dosimetry practice.
6. Provide a clinical and didactic environment which leads to the development of clinical skills and competence appropriate to an entry level Medical Dosimetrist.

#### Program Description

The Medical Dosimetrist is a member of the Allied Health and Radiation Oncology Team.

Course material and practicum covers radiation physics, radiation protection, dose calculations, tumor localization, external beam treatment planning, brachytherapy, quality assurance, medical imaging/anatomy, clinical radiation oncology, and radiobiology. Clinical practicum includes external beam treatment planning, brachytherapy treatment, preparation and planning, chart reviews and dose calculations, record and verify system data entry, simulation (conventional and CT-simulation), treatment aid fabrication, treatment machine quality assurance, stereotactic treatment planning, gamma knife, IMRT planning and treatment. Special project assignments, conference attendance, written reports, chapter

reviews, and labs are also part of the curriculum.

#### Accreditation

The Medical Dosimetry Program is fully accredited through the Joint Review Committee on Education in Radiologic Technology (JRCERT). The program at SIU was the third accredited program in the United States. [jrcert.org](http://jrcert.org).

The program meets the formal education eligibility criteria for the national certification exam following graduation, as required by the Medical Dosimetrist Certification Board. ([mdcb.org](http://mdcb.org)).

#### General Description of a Medical Dosimetrist

The Certified Medical Dosimetrist (CMD) is a member of the radiation oncology (cancer treatment) team who has knowledge of the overall characteristics and clinical relevance of radiation oncology treatment machines and equipment, is cognizant of procedures commonly used in brachytherapy (treatment with radioactive sources at a close distance) and has the education and expertise necessary to generate radiation dose distributions and dose calculations in collaboration with the Medical Physicist and Radiation Oncologist.

#### Major Duties

- Design a treatment plan by means of computer and/or manual computation that will deliver a prescribed radiation dose and field placement technique in accordance with the Radiation Oncologist's prescription to a defined tumor volume.
- Consider dose-limiting structures in the design of treatment plans and document dose in accordance with the Radiation Oncologist's prescription.
- Coordinate treatment simulations and tumor localization on dedicated devices, including Computerized Tomography (CT), Magnetic Resonance Imaging (MRI), and Positron Emission Tomography (PET) when indicated, for radiation oncology treatment planning.
- Supervise, perform, or assist in the planning of the fabrication of compensation filters, custom shields, wedges, and other beam modifying devices.
- Supervise, perform, or assist in the planning of the production of moulds, casts, and other immobilization devices.
- Supervise therapy staff in the implementation of the treatment plan including: the correct use of immobilization devices, compensators, wedges, field arrangement, and other treatment variables.
- Perform calculations for the accurate delivery of the Radiation Oncologist's prescribed dose, document all pertinent information in the patient record, and verify the mathematical accuracy of all calculations using a system established by the Medical Physicist.
- Provide physics and technical support to the Medical Physicist, in radiation protection, qualitative machine calibrations, and quality assurance of the radiation oncology equipment.
- Supervise, perform, or assist in the application of specific methods of dosimetry including ion chamber, TLD, or film

measurement as directed by the Medical Physicist.

- Assist in intracavitary and interstitial brachytherapy procedures and in the subsequent manual and/or computer calculation of the dose distributions of these treatments.
- Teach applied aspects of medical dosimetry to students and residents, as assigned.
- Participate in clinical research for the development and implementation of new techniques.
- Participate in continuing education in the area of current treatment planning techniques, and advances in medical dosimetry.

Source: [medicaldosimetry.org](http://medicaldosimetry.org)

### Eligibility for the Master of Science Program in Medical Dosimetry Track 1

Preferred candidates are individuals who have a baccalaureate degree and have been trained as a radiation therapist.

Consideration is given to applicants with a bachelor's degree in the physical or biological sciences without radiation therapy experience.

### Number of Students

Due to clinical hour requirements and the number of clinical sites, approximately 20 students per year will be allowed at this time.

### Application

Applications should be received by February 1st of the year one plans to attend the program. Class selection will occur in February/March. Two separate applications are required: One for the program and one for the Graduate School.

For more information about admission policies, transfer credit, tuition and fees, refund policies, academic calendars, academic policies, graduation requirements, and student services, please review "Degree Requirements", found in Chapter 1, in the Graduate Catalog, [gradschool.siu.edu/about-us/grad-catalog](http://gradschool.siu.edu/about-us/grad-catalog).

### Class Location

The program offers education at various clinic sites and didactic education is delivered via distance learning. Live video conferencing equipment is used to allow students to interact with the instructors in real time.

### Expenses

- Tuition: Current In-State Graduate Level Tuition and applicable Distance Education Fees.
- Textbooks and Lab Coat: Approximately \$500 - \$600.
- Living Expenses: Students must find housing on their own. This can vary greatly.
- A Computer, Scanner, and High Speed Internet will be required. Computer and bandwidth specifications will be shared once accepted into the program.

### Curriculum

The total curriculum consists of 30 semester hours. Program length is 52 weeks and the students attend classes/clinical for 40 hours per week.

Didactic component is approximately 300-350 hours. Clinical component is approximately 1650 -1700 hours. The student will

have approximately 2000 hours of education per year and have 80 hours of vacation.

### Fall Semester

RAD 510-2	Simulation and Cross Sectional Anatomy in Medical Dosimetry
RAD 515-4	Medical Dosimetry Clinical I
RAD 520-3	The Physics of Medical Dosimetry I
RAD 525-3	Seminars in Medical Dosimetry I
<b>Total:</b>	12 hours

### Spring Semester

RAD 530-2	The Essentials of Medical Dosimetry
RAD 535-4	Medical Dosimetry Clinical II
RAD 540-3	The Physics of Medical Dosimetry II
RAD 545-3	Seminar in Medical Dosimetry II
<b>Total:</b>	12 hours

### Summer Semester

RAD 550-2	Medical Dosimetry Clinical III
RAD 555-2	The Physics of Medical Dosimetry III
RAD 560-2	Seminar in Medical Dosimetry III
<b>Total:</b>	7-13 hours

### Program Director Contact Information:

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### Disclaimer

Content of the program materials is subject to change without notice.

## TRACK 2

### Program Goals

1. Provide didactic experiences that lead to research in educational, professional, or health care issues relating to medical dosimetry.
2. Provide avenues to students for professional development and growth within the profession.
3. Provide avenues for students to develop and apply skills in effective communication, analytical and critical thinking and problem-solving necessary for successful medical dosimetry practice.
4. Provide a didactic environment which leads to the development of managerial/educational skills appropriate to a Medical Dosimetrist.

### Program Description

The Medical Dosimetrist is a member of the Allied Health and Radiation Oncology Team.

Course material covers radiation physics, radiation protection, dose calculations, tumor localization, external beam treatment planning, brachytherapy, quality assurance, medical imaging/anatomy, clinical radiation oncology, and radiobiology. Special project assignments, journal article reports, and

chapter reviews as well as management and education courses are also part of the curriculum.

### Accreditation

The Medical Dosimetry Program is approved by the Illinois Board of Higher Education (IBHE) and The Higher Learning Commission of the North Central Association of Colleges and Schools.

### General Description of a Medical Dosimetrist

The Certified Medical Dosimetrist (CMD) is a member of the radiation oncology (cancer treatment) team who has knowledge of the overall characteristics and clinical relevance of radiation oncology treatment machines and equipment, is cognizant of procedures commonly used in brachytherapy (treatment with radioactive sources at a close distance) and has the education and expertise necessary to generate radiation dose distributions and dose calculations in collaboration with the Medical Physicist and Radiation Oncologist.

### Major Duties

Design a treatment plan by means of computer and/or manual computation that will deliver a prescribed radiation dose and field placement technique in accordance with the Radiation Oncologist's prescription to a defined tumor volume.

Consider dose-limiting structures in the design of treatment plans and document dose in accordance with the Radiation Oncologist's prescription.

Coordinate treatment simulations and tumor localization on dedicated devices, including Computerized Tomography (CT), Magnetic Resonance Imaging (MRI), and Positron Emission Tomography (PET) when indicated, for radiation oncology treatment planning.

Supervise, perform, or assist in the planning of the fabrication of compensation filters, custom shields, wedges, and other beam modifying devices.

Supervise, perform, or assist in the planning of the production of moulds, casts, and other immobilization devices.

Supervise therapy staff in the implementation of the treatment plan including: the correct use of immobilization devices, compensators, wedges, field arrangement, and other treatment variables.

Perform calculations for the accurate delivery of the Radiation Oncologist's prescribed dose, document all pertinent information in the patient record, and verify the mathematical accuracy of all calculations using a system established by the Medical Physicist.

Provide physics and technical support to the Medical Physicist, in radiation protection, qualitative machine calibrations, and quality assurance of the radiation oncology equipment.

Supervise, perform, or assist in the application of specific methods of dosimetry including ion chamber, TLD, or film measurement as directed by the Medical Physicist.

Assist in intracavitary and interstitial brachytherapy procedures and in the subsequent manual and/or computer calculation of the dose distributions of these treatments.

Teach applied aspects of medical dosimetry to students and residents, as assigned.

Participate in clinical research for the development and implementation of new techniques.

Participate in continuing education in the area of current

treatment planning techniques, and advances in medical dosimetry.

Source: [medicaldosimetry.org](http://medicaldosimetry.org)

### Eligibility for the Master of Science Program in Medical Dosimetry Track 2

Applicants must be a Certified Medical Dosimetrist and be current with the Medical Dosimetry Certification Board (MDCB). These individuals must also have a baccalaureate degree from an accredited university. The baccalaureate degree and academic performance must meet the entrance requirements set forth by the Graduate School at SIU.

Individuals that have been approved by the MDCB to take their exam may apply to the program but CMD verification must be documented before any classes may be taken.

### Number of Students

There is no limit to the number of students accepted for Track 2.

### Application

Continuous enrollment is allowed for Track 2. This means you may start the program with any semester. Two separate applications are required: one for the program and one for the Graduate School.

For more information about admission policies, transfer credit, tuition and fees, refund policies, academic calendars, academic policies, graduation requirements, and student services, please review the Graduate Catalog at: [gradschool.siu.edu/about-us/grad-catalog](http://gradschool.siu.edu/about-us/grad-catalog).

### Class Location

Track 2 is offered via distance learning.

### Expenses

- Tuition: Current In-State Graduate Level Tuition and applicable Distance Education Fees.
- Living Expenses: Students must find housing on their own. This can vary greatly.
- A Computer, Scanner, and High Speed Internet will be required. Computer and bandwidth specifications will be shared once enrolled.

### Curriculum

The total curriculum consists of 30 semester hours. Students may enroll only part time for this program.

Suggested Course Sequence for Track Two Students:

#### Fall Semester

RAD 511-3	Fundamentals of Health Care Systems - Odd Years
RAD 516-3	Cultural Foundations and Theories of Education - Odd Years
RAD 520-3	The Physics of Medical Dosimetry I - Even Years
RAD 525-3	Seminars in Medical Dosimetry I - Even Years

**Spring Semester**

RAD 531-3	Human Resources in Health Care - Odd Years
RAD 536-3	Strategic Leadership in Healthcare
RAD 540-3	The Physics of Medical Dosimetry II - Even Years
RAD 545-3	Seminar in Medical Dosimetry II - Even Years

**Summer Semester**

RAD 551-3	Legal and Ethical Fundamentals of Health Care - Even Years
RAD 556-3	Individual Research in Healthcare - Odd Years

**Program Director Contact Information**

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**Courses (RAD)**

**RAD 510-2 Simulation and Cross Sectional Anatomy in Medical Dosimetry.** This course covers the conventional and CT simulation techniques used in initiating radiation therapy for cancer patients. Identification of cross-sectional anatomy at different anatomical locations within the human body is also reviewed. This course is twenty weeks in length. Restricted to admission to the Medical Dosimetry Program.

**RAD 511-3 Fundamentals of Health Care Systems.** This course provides a multi-disciplinary analysis and is designed to provide students with information pertaining to the issues surrounding access to care, medical technology, and the complex financial structures of the health care system. Students will extensively examine aspects of the complex healthcare system such as managed care, Medicare, Medicaid, pharmaceuticals, health promotion and disease prevention, and the quality of care.

**RAD 515-4 Medical Dosimetry Clinical I.** This is the first course of a three course sequence. During the three course sequence, students will complete eight clinical rotations including Brachytherapy, Simulation, Gamma Knife, Treatment Aids, IMRT, External Beam, Physics, Special Measurements and QA. The length of these rotations varies from one to eleven weeks. During this course students will perform two to four of these rotations depending on the rotation schedule. While in the clinical setting students will observe and work directly with a medical dosimetrist. Emphasis is given on learning and understanding the role and responsibilities of a medical dosimetrist in the clinical setting. This course is twenty weeks in length. Restricted to the Medical Dosimetry Program.

**RAD 516-3 Cultural Foundations and Theories of Education.** Seminar provides an examination of the historical, social, economic and psychological foundations of allied health education with

emphasis given to the nature and role of education and training in preparing for the field of medical education. The objectives of this seminar will allow the student to explore the nature and theories of education, the behavioral aspects of education including the assumptions and practices which underlie education. Special approval needed from the instructor

**RAD 520-3 The Physics of Medical Dosimetry I.** This course covers the following topics: Radiologic Physics, production of x-rays, radiation treatment and simulation machines, interactions of ionizing radiation, radiation measurements, dose calculations, computerized treatment planning, dose calculation algorithms, electron beam characteristics, and brachytherapy physics and procedures. This course is twenty weeks in length. Restricted to admission to the Medical Dosimetry Program.

**RAD 525-3 Seminars in Medical Dosimetry I.** (Same as RAD 526) This course consists of various seminars/literature reviews associated with radiation oncology. Topics include treatment techniques for various cancers, technological advances in cancer treatment, cancer treatment trends, and the role of a medical dosimetrist. This course is twenty weeks in length. Restricted to admission to the Medical Dosimetry Program.

**RAD 530-2 The Essentials of Medical Dosimetry.** This course covers the various quality assurance procedures performed in a radiation oncology department. Also included are various statistics topics to educate the student in becoming a good consumer of medical dosimetry research literature. Professional development, billing/coding, HIPAA, and professional service are also addressed. This course is twenty weeks in length. Prerequisite: A grade of C or better in RAD 510, 515, 520, and 525.

**RAD 531-3 Human Resources in Health Care.** Describes the key human resource functions that play a significant role in the healthcare environment and focuses specifically on how those functions support management initiatives and accreditation and/or regulatory compliance. Extensive review of how the failure to systematically apply effective human resource strategies can result in organizational demise is conducted. Will conduct a human resource audit. Explores the dynamic legal and regulatory environment and carefully examines how legislative changes influence the healthcare organization overall focusing particularly on those functions that are linked to patient satisfaction and balanced scorecards and/or benchmarking of provider performance.

**RAD 535-4 Medical Dosimetry Clinical II.** This is the second of a three course sequence. During the three course sequence, students will complete eight clinical rotations including Brachytherapy, Simulation, Gamma Knife, Treatment Aids, IMRT, External Beam, Physics, Special Measurements and QA. The length of these rotations varies from one to eleven weeks. During this course students will perform two to four of these rotations depending on the rotation schedule. While in the clinical setting students will observe and work directly with a medical dosimetrist. Emphasis is given on learning and understanding the role and responsibilities of a medical dosimetrist in the clinical setting. This course is twenty weeks in length. Prerequisite: A grade of C or better in RAD 515.

**RAD 536-3 Administration and Supervision in Allied Health.** This course provides students with an examination of the nature, function, and techniques of administration and supervision in medical departments. This is accomplished through case analyses and practice simulations of human problems in the

healthcare organization and application of findings of behavioral science research to healthcare problems. Emphasis will be placed on the development of direction and leadership skills.

**RAD 540-3 The Physics of Medical Dosimetry II.** This course covers the following topics: Imaging for radiation Oncology, IMRT, stereotactic radiosurgery, special procedures, particle therapy, hyperthermia, and radiation safety. This course is twenty weeks in length.

**RAD 545-3 Seminars in Medical Dosimetry II.** (Same as RAD 546) This course consists of various seminars associated with radiation oncology. Topics include treatment techniques for various cancers, technological advances in cancer treatment, cancer treatment trends, and the role of a medical dosimetrist. This course is twenty weeks in length.

**RAD 550-2 Medical Dosimetry Clinical III.** This is the third course of a three course sequence. During the three course sequence, students will complete eight clinical rotations including Brachytherapy, Simulation, Gamma Knife, Treatment Aids, IMRT, External Beam, Physics, Special Measurements and QA. The length of these rotations varies from one to eleven weeks. During this course students will perform two to four of these rotations depending on the rotation schedule. While in the clinical setting students will observe and work directly with a medical dosimetrist. Emphasis is given on learning and understanding the role and responsibilities of a medical dosimetrist in the clinical setting. This course is twenty weeks in length. Prerequisite: A grade of C or better in RAD 535.

**RAD 551-3 Legal and Ethical Fundamentals of Health Care.** This course provides students with an analysis of the legal and ethical environment of the healthcare industry. Focused on the healthcare environment, the course examines the judicial process pertaining to torts, contracts, antitrust, corporate compliance, access to care, negligence, and professional liability. The nature of ethics in the multi-cultural healthcare environment is examined with an analysis of the moral issues in healthcare. Restricted to Medical Dosimetry students.

**RAD 555-2 The Physics of Medical Dosimetry III.** This course covers the following topics: MU calculations, point dose calculations and radiation biology. This course is 10 weeks in length. Prerequisite: A grade of C or better in RAD 540.

**RAD 556-3 Individual Research in Healthcare.** This course requires students to complete a research project in the field of healthcare based upon student interest and instructor approval. Each project will have a written paper as a final product and this paper will be submitted for publication, as approved by the instructor, in one of the professional journals within the field of healthcare. Restricted to Medical Dosimetry.

**RAD 560-2 Seminar in Medical Dosimetry III.** This course consists of various seminars/literature reviews associated with radiation oncology. Topics include treatment techniques for various cancers, technological advances in cancer treatment, cancer treatment trends, and the role of a medical dosimetrist. This course is 10 weeks in length. Prerequisite: A grade of C or better in RAD 545.

**RAD 565-1 to 6 Independent Study.** Directed independent study in selected areas of medical dosimetry studies. Special approval needed from the Program Director.

**RAD 601-1 Continuing Enrollment.** This course is required to satisfy the Graduate School's requirement of continuous enrollment and is intended for those students who are enrolled

in the program but cannot take a core academic course during a given semester. Prerequisite: Consent of Program Director.