MEDICAL PHYSICS PROGRAMS

Programs of study leading to the MSBS degree in Medical Physics are offered by the graduate faculty of the Department of Radiation Oncology and the Department of Radiology. In addition to the basic medical science and radiological physics coursework, a specific course of study is offered in radiation oncology physics or in diagnostic imaging. This course of study includes didactic courses, independent study, and hands-on clinical covering the selected discipline, along with specific technical research culminating in a research project or thesis. The graduate program is committed to excellence in scientific education, clinical experience, and research leading to the professional development of highly motivated and dedicated students. In addition to the capability of creative scientific research, the coursework and clinical experience is intended to provide students with the fundamental knowledge and educational requirement for eventually becoming board certified in their area of study by The American Board of Radiology, The American Board of Medical Physics, or other credentialing body.

PhD Track

The PhD in Physics with Concentration in Medical Physics: Please refer to the College of Natural Sciences Catalog (http://utoledo-public.courseleaf.com/graduate/natural-sciences-mathematics/) for additional information regarding this program, and specifically, the Department of Physics and Astronomy section for admission and degree requirements. Information also may be found at http://www.utoledo.edu/med/depts/radther/.

Research Facilities

The Department of Radiation Oncology has access to a variety of computer systems for radiation oncology treatment planning, programming, and image analysis. A wide range of radiation measuring equipment is available, including a full range of dosimetry and quality control test equipment, Wellhoffer computerized beam scanning system, an array of ionization chambers, software and hardware packages for film dosimetry and analysis, oscilloscopes, and test phantoms. Also available are multichannel analyzer scintillation detectors, autogamma, and liquid scintillation counters, diode, thermoluminescent dosimetry systems, nanodot dosimeters, digital scanner for chromic film dosimetry system, RIT densitometry package, etc.

The Medical Physics program is housed on the Health Science Campus and the University of Toledo Medical Center (UTMC) where much of the medical physics training is accomplished at the newly built Dana Cancer Center. This state-of-the-art building houses the radiation oncology department and has a division of radiology, medical oncology, and surgical oncology. All the specialists are under one roof and the concept of a true cancer center is practiced. Besides being a leader in stereotactic radiosurgery (SRS) and stereotactic Body Radiotherapy (SBRT), the University of Toledo Medical Center provides IMRT treatment planning with IGRT capabilities, conventional 3D conformal external beam radiotherapy, and other stereotactic neurologic radiosurgery capabilities such as AVM with inverse planning arc modulation technology. Other treatment modalities that students are exposed to are: Brachytherapy low and high dose rate, Radionuclide therapy using P-32, I-131, Sr-89, Ra-223, etc. There also exists a large Cs-137 irradiator is also available on campus for blood, small animal, or other cellular petri-dish irradiation.

Department of Radiation Oncology Equipment

- A Varian True Beam Linear Accelerator, capable of producing photon energies of 6MV, 10MV, and 18 MV, and 6X FFF, and a range of electron energies from 6 to 20 MeV in 2-3 MeV increments.
- A Varian Edge Linear Accelerator, capable of producing photon energies of 6MV, 10MV, 6X FFF, and 10X FFF. This is a specialized new Varian product designed for SRS/SBRT cases with 2.5 mm leafs.
- Both accelerators are equipped with latest state of the ART technology including onboard imaging, EPID MV imaging, Rapid ARC (VMAT), and Gating. The Edge unit is also capable of Optical Surface Monitoring System (OSMS) used for patient positioning.
- ARIA patient management system
- A Philips ADAC Pinnacle treatment planning software package for external beam radiotherapy planning,
- Varian Eclipse Treatment Planning system
- MIM software for rigid and deformable image fusion
- A remote afterloading High Dose Rate brachytherapy unit manufactured by Varian for treatment of interstitial, intracavitary and intraluminal tumors and the associated BrachyVision software package for HDR brachytherapy treatment planning
- VariSeed software package used for prostate seed implant program
- A Philips Gemini Large Bore PET/CT unit equipped with Sim package used for radiotherapy treatment simulations
- An array of low dose rate brachytherapy sources of CS-137 for intracavitary treatment
- A fully automated water scanning system manufactured by Welhoffer
- Various film scanning systems such as VIDAR scanners and HOWTEK scanner for normal diagnostics and chromic film dosimetry
- RIT dosimetry software system for dosimetric analysis using films
- BAT ultrasound system
- An array of ionization chambers and electrometers for dosimetry measurements including highly sensitive farmer, and parallel plate chambers, micro chambers, and scintillation chambers.
- Thermoluminesence dosimeter (TLD) system and oven for annealing TLD chips.
- A MicroStar II OSLD system with nanodots for in-vivo dosimetry

Department of Radiology Equipment

- Multiple fixed and mobile radiographic and fluoroscopic systems
- Image intensifier and flat panel solid state detector fluoroscopic systems
- Computed radiography and digital radiography systems
- Mammography and stereotactic mammography systems
- Multi-slice (16 and 64) computed tomography systems
- 1.5 and 3.0 Tesla MRI imaging systems
- 4 SPECT imaging systems
- A PET/CT imaging system
- Multiple ultrasound imaging systems

- Hospital-wide GE Centricity PACS system
- Terarecon Aquarius Image Processing workstations and image servers.
- Multiple Windows and Linux PC's for image processing and analysis
- Full complement of diagnostic medical physics test phantoms and dosimetry equipment.

To obtain a MSBS degree from the COMLS, students must complete a minimum of 40 credit hours of approved credit beyond the baccalaureate, with at least 25 credits in didactic course work (requiring a grade) and a minimum of 10 credits in Thesis Research (INDI699).

The MSBS degree in Medical Physics typically involves 55 credit hours over a 22 months period.

Medical physics core courses include:

Code	Title	Hours
MPHY 6310	Anatomy/Physiology	4
INDI 6020	On Being a Scientist	1
MPHY 6010	Survey of Diagnostic Medical Imaging I	3
MPHY 6120	Radiation Dosimetry I	3
MPHY 6160	Radiation Biology	3
MPHY 6300	Radiation Detection/Measuremen	3
MPHY 6200	Radiatn Protect and Regulation	3
MPHY 6110	Survey Clinical Radi Therapy	2
MPHY 6500	Medical Physics Seminar	1
INDI 6990	Thesis Research	10

Typical course curriculum in Medical Physics - Radiation Oncology track include:

Code	Title	Hours
Radiological Physics		
MPHY 6130	Radiation Dosimetry II	
MPHY 6180	Physics of Radiation Therapy	
MPHY 6190	Brachytherapy	
MPHY 6320	Practical Measurements in Rad	

Typical course curriculum in Medical Physics - Diagnostic Imaging track include:

Code	Title	Hours
MPHY 6020	Survey of Diagnostic Medical Imaging II	
MPHY 6060	Nuclear Medicine	
MPHY 6860	Independent Study in Radiology (CT and MRI)	

Non-thesis option

A non-thesis option is available for students who present advanced degrees from previous graduate work which included a scientific thesis or dissertation.