MEDICAL PHYSICS (MED PHYS)

MED PHYS/PHYSICS 265 – INTRODUCTION TO MEDICAL PHYSICS
2 credits.

A general interest survey that introduces the principles and applications of medical physics. Topics include biomechanics, energy usage and temperature regulation, pressure, sound and hearing, ultrasound, electricity in the body, optics and the eye, ionizing radiation in diagnosis and therapy, radiobiology, and nuclear medicine.
Requisites: PHYSICS 104, 202, 208, or 248
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2026
Learning Outcomes: 1. Apply physics concepts, such as force, energy, and pressure, to the study of human physiology
Audience: Undergraduate

2. Describe the relevance of physics concepts to the etiology of major disease, such as heart failure, sudden cardiac death, obstructive lung disease, and nerve conduction disorders
Audience: Undergraduate

3. Explain the principles of medical imaging based on x-rays, gamma rays, sound, and other physical phenomena
Audience: Undergraduate

4. Understand the principles of radiobiology that underlie radiation sickness and radiation therapy
Audience: Undergraduate

MED PHYS/H ONCOL 410 – RADIOBIOLOGY
2-3 credits.

Effects of ionizing radiations of living cells and organisms, including physical, chemical, and physiological bases of radiation cytotoxicity, mutagenicity, and carcinogenesis; lecture and lab.
Requisites: Graduate/professional standing or (PHYSICS 202 or 208 and ZOOLOGY/BIOLOGY/BOTANY 152 or 153)
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2026
Learning Outcomes: 1. Gain an understanding of the physical, chemical and molecular basis of the action of radiation on biological systems
Audience: Both Grad & Undergrad

2. Describe the radiobiological principles forming the basis for the use of radiation as a cancer therapy
Audience: Both Grad & Undergrad

3. Understand the potential deleterious short and longer-term effects of radiation on normal tissues and organs and on the whole body
Audience: Both Grad & Undergrad

4. Describe how chemotherapy and molecularly targeted agent can alter response of biological systems to radiation.
Audience: Both Grad & Undergrad

5. Understand the principles of radiation protection
Audience: Graduate

MED PHYS/B M E/H ONCOL/PHYSICS 501 – RADIATION PHYSICS AND DOSIMETRY
3 credits.

Interactions and energy deposition by ionizing radiation in matter; concepts, quantities and units in radiological physics; principles and methods of radiation dosimetry.
Requisites: (PHYSICS 323, 449 and MATH 320) or graduate/professional standing or declared in Medical Physics VISP
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Use the physics of microscopic structures of nucleus, nuclear decay, electronic structure of atoms to calculate nuclear decay lifespan and solid state energy band structure
Audience: Both Grad & Undergrad

2. Calculate the radiation power spectrum for an accelerating charge particle under different physical conditions
Audience: Both Grad & Undergrad

3. Calculate cross-sections for the following interaction processes between photons and matter: Rayleigh scattering, photoelectric effect, Compton scattering, and pair production
Audience: Both Grad & Undergrad

4. Calculate the scattering cross-section of Coulomb scattering and energy transfer cross-section in collisions processes and radiative energy loss processes
Audience: Both Grad & Undergrad

5. Calculate radiation dose for both external photon beams, neutron beams, and charged particle beams
Audience: Both Grad & Undergrad

6. Identify open research topics in radiation imaging, radiation therapy, and radiation protection fields
Audience: Graduate

MED PHYS/N E 506 – MONTE CARLO RADIATION TRANSPORT
3 credits.

Use of Monte Carlo technique for applications in nuclear engineering and medical physics. Major theory of Monte Carlo neutral particle transport is discussed. Standard Monte Carlo transport software is used for exercises and projects. Major emphasis is on analysis of real-world problems.
Requisites: N E 305 and (N E 405, N E 408, PHYSICS/B M E/H ONCOL/MED PHYS 501 or N E/MED PHYS 569) or graduate/professional standing
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2026
Learning Outcomes: 1. Use an industry-relevant software package to perform Monte Carlo radiation transport simulations for analysis of fixed source and/or multiplying systems
Audience: Both Grad & Undergrad

2. Explain how random processes are used to simulate a single particle transport history through an engineering system, including source, streaming and collisions
Audience: Both Grad & Undergrad

3. Explain how the paths of many particle transport histories are combined to provide estimates of engineering results
Audience: Both Grad & Undergrad

4. Analyze the statistical performance of a simulation and suggest ways to improve that performance
Audience: Both Grad & Undergrad

5. Apply Monte Carlo radiation transport to a problem related to your research
Audience: Graduate

MED PHYS 510 – FUNDAMENTALS OF CELLULAR, MOLECULAR, AND RADIATION BIOLOGY
3 credits.

Cellular, molecular, and radiation biology principles and their common application in medical physics.
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Explore a new phenomenon or modality in the medical physics area and apply the knowledge gained to research in the field
Audience: Both Grad & Undergrad

2. Describe fundamental biomolecule and molecular biology principles and their common applications in medical physics.
Audience: Both Grad & Undergrad

3. Describe fundamental cellular biology principles and their common applications in medical physics.
Audience: Both Grad & Undergrad

4. Describe fundamental radiation biology principles and their applications in medical physics.
Audience: Both Grad & Undergrad

5. Describe fundamental immunology principles and their applications in medical physics.
Audience: Both Grad & Undergrad

6. Demonstrate an ability to integrate key fundamental principles of immunology and cellular, molecular, and radiation biology in medical physics applications in both imaging as well as therapy.
Audience: Both Grad & Undergrad

7. Propose and discuss example medical physics applications of fundamental principles of immunology and cellular, molecular, and radiation biology.
Audience: Graduate

MED PHYS/B M E 535 – INTRODUCTION TO ENERGY-TISSUE INTERACTIONS
3 credits.

Explore physical interactions between thermal, electromagnetic and acoustic energies and biological tissues with emphasis on therapeutic medical applications.
Requisites: PHYSICS 202, 208, 248, or PHYSICS/MED PHYS 265, or graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2025
Learning Outcomes: 1. Derive and solve bioheat transfer problems relevant to therapeutic hyperthermia and hypothermia
Audience: Both Grad & Undergrad

2. Explain changes at the tissue and cellular levels during thermal therapies
Audience: Both Grad & Undergrad

3. Analyze technologies that apply electromagnetic and acoustic energy to tissue
Audience: Both Grad & Undergrad

4. Discuss medical applications and regulatory guidelines/requirements involving energy-tissue interactions
Audience: Both Grad & Undergrad

5. Demonstrate an advanced ability to synthesize recent literature, formulate technical problems, and describe plausible solutions
Audience: Graduate

MED PHYS/B M E 566 – PHYSICS OF RADIOTHERAPY
3 credits.

Ionizing radiation use in radiation therapy to cause controlled biological effects in cancer patients. Physics of the interaction of the various radiation modalities with body-equivalent materials, and physical aspects of clinical applications.
Requisites: PHYSICS/B M E/H ONCOL/MED PHYS 501
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2026
Learning Outcomes: 1. Demonstrate knowledge of the potentials and limits, with respect to fundamental physics, of ionizing radiation production and therapy
Audience: Both Grad & Undergrad

2. Apply the concepts and/or techniques of radiation physics in cancer therapy
Audience: Both Grad & Undergrad

3. Accurately compute radiation dose and dose delivery for clinically acceptable conditions
Audience: Both Grad & Undergrad

4. Communicate applied concepts in a clear and understandable manner
Audience: Undergraduate

5. Communicate complex applied concepts in a clear and understandable manner, including concepts of medical imaging, radiation biology, radiation production, and radiation detection as they apply to radiation physics in cancer therapy
Audience: Graduate

MED PHYS/B M E 567 – THE PHYSICS OF DIAGNOSTIC RADIOLOGY
4 credits.

Physics of x-ray diagnostic procedures and equipment, radiation safety, general imaging considerations; lecture and lab.
Requisites: MATH 234 and (PHYSICS 241 or 249) or graduate/professional standing
Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018
Learning Outcomes: 1. Learn the physics and technology of medical x-ray system design and the parameters that determine image contrast, noise, spatial resolution, and patient radiation dose.
Audience: Both Grad & Undergrad

2. Gain a detailed knowledge of x-ray sources, x-ray detectors, and data acquisition strategies used in radiography, mammography, fluoroscopy, angiography and computed tomography.
Audience: Both Grad & Undergrad

3. Apply a knowledge of x-ray systems and physics to analyze and compare the performance of different medical x-ray imaging systems.
Audience: Both Grad & Undergrad

4. Through laboratory modules, receive hands on experience concerning the first three objectives. This includes learning the proper means for evaluating the performance and conducting measurements on x-ray systems which are commonly done by a clinical medical physicist.
Audience: Both Grad & Undergrad

5. Identify the defining strengths and limitations with utilizing the imaging modalities for conducting research investigations of human physiology and disease.
Audience: Graduate

MED PHYS/B M E 568 – MAGNETIC RESONANCE IMAGING (MRI)
2 credits.

Core course covering the physics associated with magnetic resonance imaging emphasizing techniques employed in medical diagnostic imaging. Major MRI topics include: physics of MR, pulse sequences, hardware, imaging techniques, artifacts, and clinical applications. At the completion of this course, students should have an understanding of the technical and scientific details of modern magnetic resonance imaging and its use in diagnosing disease. Graduate students who have not taken MATH 222 and PHYSICS 202 at UW-Madison must have the equivalent coursework in order to be successful in this course.
Requisites: Graduate/professional standing or (MATH 222 and PHYSICS 202, 208, 241, 244, 248 or 249)
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2022
Learning Outcomes: 1. Identify the mechanisms in which nuclear magnetic resonance harnessed for imaging
Audience: Both Grad & Undergrad

2. Differentiate the different MRI sequences used and the appearance of disease aspects in each of these sequences
Audience: Both Grad & Undergrad

3. Evaluate potential biological effects of imaging on patients and effects of patients on imaging
Audience: Both Grad & Undergrad

4. Contextualize the acquired knowledge to formulate research questions to solve specific clinical needs
Audience: Graduate

MED PHYS/N E 569 – HEALTH PHYSICS AND BIOLOGICAL EFFECTS
3-4 credits.

Physical and biological aspects of the use of ionizing radiation in industrial and academic institutions; physical principles underlying shielding instrumentation, waste disposal; biological effects of low levels of ionizing radiation.
Requisites: MATH 234 and (PHYSICS 241 or 249), graduate/professional standing, or declared in Medical Physics VISP
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Investigate theoretical concepts that are used in radiation safety practice.
Audience: Both Grad & Undergrad

2. Evaluate the effectiveness of radiation safety practice considering theoretical, economic, political, and societal perspectives.
Audience: Both Grad & Undergrad

3. Consider the ethical consequences of radiation safety regulations.
Audience: Both Grad & Undergrad

4. Integrate knowledge into research and/or clinical work
Audience: Graduate

MED PHYS/B M E 573 – MATHEMATICAL METHODS IN MEDICAL PHYSICS
3 credits.

Mathematical fundamentals required for medical physics and biomedical applications, including signal analysis and mathematical optimization.
Requisites: (MATH 234 and 319), (MATH 234 and 320), or MATH 376 and (PHYSICS 202 or 208), graduate/professional standing, or declared in Medical Physics VISP
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Summarize the utility of signal analysis in one and several dimensions
Audience: Both Grad & Undergrad

2. Identify and apply convolutions and Fourier Transforms in one and several dimensions
Audience: Both Grad & Undergrad

3. Apply the properties of the Fourier Transform in medical physics and other biomedical settings
Audience: Both Grad & Undergrad

4. Illustrate the limitations of the Fourier transform, and recall the advantages of alternative signal analysis tools (e.g. wavelet transform)
Audience: Graduate

5. Distinguish between types of optimization problems, including convex vs non-convex, and unconstrained vs constrained
Audience: Both Grad & Undergrad

6. Recognize the relative performance of basic optimization algorithms
Audience: Both Grad & Undergrad

7. Formulate image reconstruction as an optimization problem
Audience: Both Grad & Undergrad

8. Formulate therapy planning as an optimization problem
Audience: Both Grad & Undergrad

9. Implement practical optimization algorithms using computational methods
Audience: Both Grad & Undergrad

MED PHYS/B M E 575 – DIAGNOSTIC ULTRASOUND IMAGING
2 credits.

Propagation of ultrasonic waves in biological tissues; principles of ultrasonic measuring and imaging instrumentation; design and use of currently available tools for performance evaluation of diagnostic instrumentation; biological effects of ultrasound.
Requisites: Graduate/professional standing or (MATH 234, 319, or 320 and PHYSICS 202 or 208)
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019
Learning Outcomes: 1. Explain principles underlying ultrasound propagation and biological effects of ultrasound.
Audience: Both Grad & Undergrad

2. Apply knowledge of clinical uses and limitations/artifacts of ultrasound imaging.
Audience: Both Grad & Undergrad

3. Recall the technical details of modern medical ultrasound devices and methods to measure acoustic parameters.
Audience: Both Grad & Undergrad

4. Utilize and integrate ultrasound imaging approaches for diagnostic and therapeutic research and clinical applications.
Audience: Graduate

MED PHYS/B M E 578 — NON-IONIZING DIAGNOSTIC IMAGING
4 credits.

Covers the physics associated with magnetic resonance imaging and diagnostic ultrasound emphasizing techniques employed in medical diagnostic imaging. Major MRI topics include: physics of MR, pulse sequences, hardware, imaging techniques, artifacts, and spectroscopic localization. Ultrasound based topics covered include: propagation of ultrasonic waves in biological tissues, principles of ultrasonic measuring and imaging instrumentation, design and use of currently available tools for performance evaluation of diagnostic instrumentation, and biological effects of ultrasound. Gain an understanding of the technical and scientific details of modern non-ionizing medical magnetic resonance and ultrasound devices and their use in diagnosing disease.
Requisites: MATH 234, (MATH 319 or 320) and (PHYSICS 202, 208, 241 or 248), or graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2026
Learning Outcomes: 1. Accurately describe, using the correct mathematics and terminology, how the signals for MRI and ultrasound are generated, the sensitivity of these techniques to tissue variations
Audience: Both Grad & Undergrad

2. Accurately describe, using the correct mathematics and terminology, spatial encoding methods for MRI and ultrasound and trade offs in imaging parameter and hardware selection
Audience: Both Grad & Undergrad

3. Identify and develop strategies to mitigate common artifacts
Audience: Both Grad & Undergrad

4. Understand how to apply the knowledge to their own research projects
Audience: Graduate

MED PHYS/B M E 580 — THE PHYSICS OF MEDICAL IMAGING WITH IONIZING RADIATION
4 credits.

Concepts and principles on the physics of medical imaging systems that form images using high energy photons are presented. Such systems are divided into two categories: (1) those based on the transmission of x-rays through the human body, including radiography, mammography, fluoroscopy, and computed tomography (CT), and (2) those based on the emission of gamma rays or annihilation radiation following radioactive decay of an internal radiolabeled molecule, including the gamma camera, single photon emission tomography (SPECT), and positron emission tomography (PET) and PET hybrid imaging systems. Emphasis is placed on understanding how physics, system design, and imaging technique determine image performance metrics such as contrast, signal-to-noise ratio, and spatial resolution. Clinical applications and radiation safety concepts are detailed for the different types of imaging systems.
Requisites: PHYSICS/B M E/H ONCOL/MED PHYS 501 and MED PHYS/B M E 573
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2026
Learning Outcomes: 1. Identify the physical principles underlying imaging technologies used in radiology and nuclear medicine: radiography, mammography, fluoroscopy, computed tomography (CT), scintigraphy, single-photon emission tomography (SPECT), and positron emission tomography (PET).
Audience: Both Grad & Undergrad

2. Describe each imaging modality in terms of a general imaging framework in which (i) a form of energy or probe is introduced to the body, (ii) a clinically interesting signal is generated within the body, and (iii) this signal is detected and spatially localized to form an image.
Audience: Both Grad & Undergrad

3. Apply physics and engineering concepts to understand how the design and operation of an imaging system determines the contrast, noise, and spatial resolution of the images produced by the system.
Audience: Both Grad & Undergrad

4. Differentiate the characteristics of radiotracers that make them suitable for research and clinical applications in human physiology.
Audience: Both Grad & Undergrad

5. Identify the defining strengths and limitations with utilizing the imaging modalities for conducting research investigations of human physiology and disease.
Audience: Graduate

MED PHYS 581 – LABORATORY FOR MEDICAL IMAGING WITH IONIZING RADIATION
1 credit.

Presents concepts and principles on the physics of medical radiographic imaging systems, based on the transmission of x-rays. Emphasis is placed on understanding the operation of imaging equipment and how it is used in clinical applications. Evaluation of imaging systems, optimization of their use and design and the solution of image quality problems is investigated.
Requisites: B M E/MED PHYS 580
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Identify the physical components of diagnostic x-ray imaging equipment
Audience: Both Grad & Undergrad

2. Summarize the operation and clinical uses of these imaging systems
Audience: Both Grad & Undergrad

3. Test and analyze the performance characteristics of diagnostic x-ray imaging equipment
Audience: Both Grad & Undergrad

4. Investigate factors that affect image quality and patient dose in x-ray imaging systems involving their use and design
Audience: Both Grad & Undergrad

5. Apply investigative thinking to the solution of image problems and artifacts
Audience: Both Grad & Undergrad

6. Apply what has been learned to their current research project
Audience: Graduate

MED PHYS/B M E/PHMCOL-M/PHYSICS/RADIOL 619 – MICROSCOPY OF LIFE
3 credits.

Survey of state of the art microscopic, cellular and molecular imaging techniques, beginning with subcellular microscopy and finishing with whole animal imaging.
Requisites: PHYSICS 104, 202, 208, or 248 or PHYSICS/MED PHYS 265
Course Designation: Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025

MED PHYS 651 – METHODS FOR NEUROIMAGING RESEARCH
3 credits.

Provides a practical foundation for neuroimaging research studies with statistical image analysis. Specific imaging methods include functional BOLD MRI, structural MRI morphometry, and diffusion tensor imaging. Lectures and associated in-class computer exercises will cover the physics and methods of image acquisition, steps and tools for image analyses, the basis for statistical image analyses and interpretation of the results.
Requisites: Graduate/professional standing or (PHYSICS 104, 202 or 208)
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Develop a basic understanding of magnetic resonance imaging, anatomical imaging methods, functional BOLD MRI (fMRI), and diffusion tensor imaging (DTI).
Audience: Both Grad & Undergrad

2. Learn and apply basic methods for statistical image analyses.
Audience: Both Grad & Undergrad

3. Gain hands-on experience with tools for processing and analyses of fMRI, DTI and anatomic brain images.
Audience: Both Grad & Undergrad

4. Develop and demonstrate skills to independently process, analyze, troubleshoot and interpret MRI neuroimaging data
Audience: Graduate

MED PHYS 662 – RAD LAB - DIAGNOSTIC RADIOLOGICAL PHYSICS
1 credit.

Provides hands on experience using and testing radiographic, fluoroscopic and mammographic x-ray systems. Imaging requirements, image quality, and radiation dose aspects of each modality are covered, along with practical methods for evaluating the performance of clinical units.
Requisites: MED PHYS/B M E 580 or declared in Medical Physics VISP
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2025
Learning Outcomes: 1. Describe the major components and geometry of radiographic, fluoroscopic and mammographic x-ray systems and how they function
Audience: Both Grad & Undergrad

2. Describe the characteristics of radiation dose in radiographic, fluoroscopic and mammographic x-ray systems scanning including the x-ray dose index, average dose in the scanned volume and effective dose; as well as the effect of scan parameters on the radiation dose to the patient
Audience: Both Grad & Undergrad

3. Perform a physicist's evaluation of a radiographic, fluoroscopic and mammographic x-ray systems including measurements of geometric accuracy, image quality and radiation dose
Audience: Both Grad & Undergrad

4. Explain the characteristics of radiographic, fluoroscopic and mammographic x-ray systems quality including pixel values, contrast, noise, low contrast detectability and spatial resolution
Audience: Graduate

5. Demonstrate understanding of some of the basic system tests, as recommended by the American College of Radiology (ACR), that are performed during routine quality assurance testing of a radiographic, fluoroscopic and mammographic x-ray systems
Audience: Graduate

MED PHYS 663 – RAD LAB - NUCLEAR MEDICINE PHYSICS
1 credit.

Provides an introduction to the technical skills required in nuclear medicine physics. This includes laboratory rotations in basic radiopharmaceutical production and quality control, basic operation and quality control testing on PET and SPECT scanners, time series image analysis of radiotracer studies and nuclear medicine dosimetry and radiation safety training. Gain a firsthand understanding of the professional duties performed by a nuclear medicine medical physicist.
Requisites: MED PHYS/B M E 580 or declared in Medical Physics VISP
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2026
Learning Outcomes: 1. Identify the basic methods for the production of radionuclides used in nuclear medicine imaging, including cyclotron produced parent / progeny generators.
Audience: Both Grad & Undergrad

2. Illustrate how to perform evaluations/ testing of the nuclear medicine imaging systems for proper performance. This includes scanner characteristic measures that would be made for acceptance test and periodic QC measures.
Audience: Both Grad & Undergrad

3. Perform these evaluations/tests in an accurate fashion.
Audience: Both Grad & Undergrad

4. Analyze the results of these tests.
Audience: Both Grad & Undergrad

5. Create a report of these results which document the findings and communicate them to someone who is not a scientist.
Audience: Both Grad & Undergrad

6. Properly use individual radiation protection techniques during the testing.
Audience: Both Grad & Undergrad

7. Describe how radionuclides are synthesized into radiopharmaceuticals for human use. This includes how quality control tests are performed and the significance of each test.
Audience: Graduate

MED PHYS 664 – RAD LAB - HEALTH PHYSICS
1 credit.

Uses project-based learning (PBL) as a powerful teaching method to address common challenges and solutions addressed by medical health physicists. Each semester, students work on a different project that addresses concepts that are important in the current health physics environment.
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2024
Learning Outcomes: 1. Learn about health physics instrumentation through hands-on experiments
Audience: Both Grad & Undergrad

2. Operate health physics instrumentation to address relevant health physics problems
Audience: Both Grad & Undergrad

3. Learn statistical principles of laboratory data analysis.
Audience: Both Grad & Undergrad

4. Communicate lab results clearly and effectively through high quality written reports.
Audience: Both Grad & Undergrad

5. Integrate knowledge into other course material, research and/or clinical work.
Audience: Graduate

MED PHYS 665 – RAD LAB - CT, MRI, AND DSA PHYSICS
1 credit.

Provides hands on experience using and testing computerized tomography (CT), magnetic resonance imaging (MRI), and digital subtraction angiography (DSA) systems. Image quality, MRI and radiation safety, accreditation, and regulatory compliance issues with these modalities are also covered.
Requisites: B M E/MED PHYS 580 and 578 or declared in Medical Physics VISP
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Describe the major components and geometry of current computed tomography (CT) scanners and the factors affecting image quality and radiation dose in CT scans.
Audience: Both Grad & Undergrad

2. Explain the characteristics of CT image quality including pixel values, contrast, noise, low contrast detectability and spatial resolution.
Audience: Both Grad & Undergrad

3. Describe the characteristics of radiation dose in CT scanning including: dose profiles, the CT dose index, average dose in the scanned volume and effective dose; as well as the effect of scan parameters on the radiation dose to the patient.
Audience: Both Grad & Undergrad

4. Perform a physicist’s evaluation of a CT scanner including measurements of geometric accuracy, image quality and radiation dose.
Audience: Graduate

5. Explain the safety screening process that all patients must undergo in order to determine whether they are eligible to safely undergo an MRI exam.
Audience: Both Grad & Undergrad

6. Describe the function of i) the major components of the MRI system, including the main magnetic field, the radiofrequency transceiver, and the magnetic field gradients, ii) the elements included in every MRI room, including the radiofrequency shielding, the magnet rundown unit, and the cryogen exhaust system, and iii) patient safety considerations related to these components.
Audience: Both Grad & Undergrad

7. Understand some of the basic system tests, as recommended by the American College of Radiology (ACR), that are performed during routine quality assurance testing of an MRI system.
Audience: Graduate

8. Identify the components of a digital subtraction angiography system.
Audience: Both Grad & Undergrad

9. Understand the basic properties of DSA systems; contrast, signal to noise ratio, image dynamic range, and logarithmic image processing.
Audience: Both Grad & Undergrad

10. Understand dual-energy subtraction and its advantages and disadvantages compared to time subtraction.
Audience: Graduate

MED PHYS 666 – RAD LAB - MEDICAL ULTRASOUND PHYSICS
1 credit.

Introduces concepts and methodology for measuring acoustic properties of materials and for operating and performing physics tests of state of the art clinical ultrasound scanners. Set up and operate a laboratory apparatus employing single element ultrasound transducers. This is followed by hands on experiments that challenge students to explain physical and engineering characteristics of clinical scanners, details of operator controls, features of Doppler and color flow modes, and resolution limitations. Practical scanning exercises provide familiarity with selected applications of clinical ultrasound equipment, both for diagnosis and for guiding interventions. Routine quality assurance tests done by medical physicists are also performed.
Requisites: MED PHYS/B M E 578 or declared in Medical Physics VISP
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Provide a technical overview of ultrasound scanner operations, including relevant tissue properties involved in forming images, ultrasound transducer properties and types, signal processing, image frame rate limitations, and typical instrument controls.
Audience: Both Grad & Undergrad

2. Demonstrate basic operation of an ultrasound scanner (GE Logiq E9 or Siemens Acuson Sequoia). This will be done using basic ultrasound QA phantoms.
Audience: Both Grad & Undergrad

3. Describe Doppler and color flow modes and indicate technical factors needed to measure blood flow accurately.
Audience: Both Grad & Undergrad

4. Show how instrumentation settings affect gray scale imaging and Doppler data from selected sites, such as the human carotid artery, the heart, or the abdomen.
Audience: Both Grad & Undergrad

5. Show the difference between cystic and solid lesions using phantoms; demonstrate image guided interventions using phantoms.
Audience: Both Grad & Undergrad

6. Complete the tests (i.e., system set up and scanning) and report writing for basic quality assurance testing following American College of Radiology (ACR) guidelines.
Audience: Graduate

MED PHYS 671 – SELECTED TOPICS IN MEDICAL PHYSICS
1-4 credits.

In-depth examination of current and newly discovered modalities and/or phenomenons in medical physics. Critical reading of literature, hands-on lab work and exploration of medical issues related to discoveries will be included.
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2026
Learning Outcomes: 1. Explore a new phenomenon or modality in the medical physics area and apply the knowledge gained to research in the field
Audience: Graduate

2. Identify the physical principles underlying imaging technologies used in radiology and nuclear medicine: radiography, mammography, fluoroscopy, computed tomography (CT), scintigraphy, single-photon emission tomography (SPECT), and positron emission tomography (PET).
Audience: Both Grad & Undergrad

MED PHYS 674 – DATA SCIENCE IN MEDICAL PHYSICS
3 credits.

Concepts and principles of statistics and machine learning for medical physics-related research problems. Topics covered include probability and independence, discrete and continuous random variables and statistical distributions, random sampling and central limit theorem, inference for means, variances, proportions, moment generating functions, maximum likelihood, hypothesis testing, ANOVA, linear regression, correlation and basic design of experiments with application to quality assurance, reliability, and reproducibility.
Requisites: (PHYSICS/B M E/H ONCOL/MED PHYS 501 and B M E/MED PHYS 573) or (STAT/MATH 309 or 431) or graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2026
Learning Outcomes: 1. Analyze experimental data by calculating mathematical expectation, co-variance, and variance for both discrete and continuous random variables from experimental measurements and determine statistical parameters using parametric statistical models
Audience: Both Grad & Undergrad

2. Draw proper statistical conclusions from experimental data by constructing confidence intervals for estimated statistical parameters from data at a given statistical significance level and formulate a statistical hypothesis for drawing possible conclusions. Construct test statistics to perform hypothesis testing using the P-value method and the rejection-zone method at a given significance level
Audience: Both Grad & Undergrad

3. Perform supervised learning using linear regression methods and interpret the regression results for experimental data as well as perform supervised learning using logistic regression methods for classification tasks such as image segmentation
Audience: Both Grad & Undergrad

4. Perform unsupervised learning using K-means clustering, Expectation-Maximization (EM) methods, and kernel tricks to recognize underlying patterns in experimental data as well as perform supervised learning using deep neural network modeling and backpropagation learning schemes
Audience: Graduate

MED PHYS 679 – RADIATION PHYSICS METROLOGY
3 credits.

Metrology, the science of measurement, is a critical component of medical physics. Topics covered: measurement statistics, determination of uncertainty, characteristics of ionization chambers, electrometers and other ionizing radiation measurement devices. Effects of instrumentation on clinical measurements.
Requisites: PHYSICS/B M E/H ONCOL/MED PHYS 501
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Integrate the physics and operation of ionization chambers and electrometers
Audience: Both Grad & Undergrad

2. Integrate the physics and operation of other instruments used for dosimetry
Audience: Both Grad & Undergrad

3. Analyze and apply the luminescent process and its use in metrology
Audience: Both Grad & Undergrad

4. Evaluate and demonstrate principles of uncertainty involved in metrology
Audience: Graduate

MED PHYS/PHYSICS 688 — RADIATION PRODUCTION AND DETECTION
4 credits.

Physics of ionizing radiation production and detection in medical science; ionization chambers, solid-state detectors, charged and neutral particles for external beam radiotherapy, radionuclides activated with accelerators for diagnostic and therapeutic applications, radiochemistry, and X-ray tube physics.
Requisites: PHYSICS/B M E/H ONCOL/MED PHYS 501
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2026
Learning Outcomes: 1. Achieve competence in experimental measurement methods of radiation dose
Audience: Both Grad & Undergrad

2. Develop a functional understanding of the principles and operation of the major types of ionizing radiation detectors used in modern medical physics including ion chambers, scintillators, semiconductors, chemical detectors, and calorimeters.
Audience: Both Grad & Undergrad

3. Apply fundamental atomic and nuclear physics and chemistry to radiation production using charged and neutral particles with accelerators and reactors, especially in the context of radionuclide production for diagnostic and therapeutic medical applications.
Audience: Both Grad & Undergrad

4. Develop an understanding of the principles and operation of medical electron linear accelerators for radiation therapy.
Audience: Both Grad & Undergrad

5. Apply physics and engineering concepts to understand the basic hardware configuration of an x-ray tube, the production of electrons by thermionic emission, the acceleration of electrons to a target material, and the physical interactions in the target resulting in x-rays.
Audience: Both Grad & Undergrad

6. Apply what has been learned to their current research project.
Audience: Graduate

MED PHYS 699 — INDEPENDENT READING OR RESEARCH
1-3 credits.

Provides opportunities for graduate students to gain experience using the scientific method to address specific scientific problems. This includes selection of a research topic, performing literature reviews to evaluate peer-reviewed and other publications, developing a research design, identifying possible pitfalls, and performing and reporting on experiments performed. Communication of the research findings within and outside the university is encouraged.
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2026
Learning Outcomes: 1. Apply concepts learned in coursework to real life situations
Audience: Both Grad & Undergrad

2. Read and effectively analyze scientific literature
Audience: Both Grad & Undergrad

3. Develop critical, analytical, and independent thinking skills
Audience: Both Grad & Undergrad

4. Create literature reviews and publications
Audience: Graduate

MED PHYS 701 – ETHICS AND THE RESPONSIBLE CONDUCT OF RESEARCH AND PRACTICE OF MEDICAL PHYSICS
1 credit.

Addresses the concepts of ethics in the daily practice of medical physics and other scientific disciplines and provide tools for identifying resources. Special emphasis will be placed in how these principles have to be applied to ensure the confidentiality of the patients, the safety of the research subjects (human and animals), differentiation between ethical and legal issues, as well as the understanding of the principles that deal with authorships, intellectual property in the academic- and industry- based environment.
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Recall and discuss the rationale behind the ethical principles governing medical physics practice
Audience: Graduate

2. Apply these principles to ensure the confidentiality of the patients, and the safety and respect of the research subjects (humans and animals).
Audience: Graduate

3. Ensure proper and honest data collection and analysis
Audience: Graduate

4. Identify and prevent conflict of interest
Audience: Graduate

5. Discuss and define authorships, and basic intellectual property concepts for the academic- and industry- based environment.
Audience: Graduate

MED PHYS/PEDIAT 705 – WOMEN AND LEADERSHIP: SCIENCE, HEALTH AND ENGINEERING
2 credits.

Multiple professional and scientific groups have identified the underrepresentation and lack of advancement of women in academia as a national workforce problem. Review evolving perspectives of leadership and how unconscious assumptions about the behaviors and traits of men, women, and leaders impede women's advancement. Emphasizes the implications for women in the fields of science, health and engineering and explore the potential impact on the advancement of knowledge and improvements in health. Provides the opportunity to apply evidence-based perspectives using experiential methods.
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2024
Learning Outcomes: 1. Be conversant with several definitions and styles of leadership, as well as with research on how leadership and gender intersect/interact, particularly in an academic context.
Audience: Graduate

2. Reflect on personal leadership goals and skills based on readings, discussion, and online reflection assignments.
Audience: Graduate

3. Demonstrate knowledge of effective evidence-based leadership strategies.
Audience: Graduate

4. Consider the integral link between women leaders and the advancement of women’s health.
Audience: Graduate

MED PHYS/B M E 710 – ADVANCES IN MEDICAL MAGNETIC RESONANCE
3 credits.

Addresses the theory and applications of magnetic resonance (MR) in medicine, by providing the necessary theoretical background to understand advanced MR techniques including magnetic resonance imaging (MRI).
Requisites: MED PHYS/B M E 568 or 578
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Recall and apply principles of MR signal generation, relaxation, echo generation, and spatial encoding.
Audience: Graduate

2. Compose and test concepts of advanced MR image reconstruction concepts including partial Fourier MRI, parallel MRI, non-Cartesian MRI, compressed sensing.
Audience: Graduate

3. Apply and judge image processing methods for the analysis of MR images for biomarkers such as T1 and T2 mapping and metabolite maps.
Audience: Graduate

4. Summarize and organize advanced MR applications used in the clinic and research including quantitative MRI, BOLD MRI (fMRI), MR Angiography with and without contrast agents, motion sensitive MRI, perfusion and diffusion MRI, and PET-MRI.
Audience: Graduate

5. Organize and compose concepts on sampling theory, signal-to-noise, artifacts, and pulse sequences to design protocols for MRI data acquisition, reconstruction, or processing.
Audience: Graduate

6. Demonstrate scientific communication skills for MRI research by composing oral presentations, written reports, and critiquing the work of others.
Audience: Graduate

MED PHYS/B M I/COMP SCI/E C E 722 – COMPUTATIONAL OPTICS AND IMAGING
3 credits.

Computational imaging includes all imaging methods that produce images as a result of computation on collected signals. Learn the tools to design new computational imaging methods to solve specific imaging problems. Provides an understanding of the physics of light propagation and measurement, and the computational tools to model it, including wave propagation, ray tracing, the radon transform, and linear algebra using matrix and integral operators and the computational tools to reconstruct an image, including linear inverse problems, neural networks, convex optimization, and filtered back-projection. Covers a variety of example computational imaging techniques and their applications including coded apertures, structured illumination, digital holography, computed tomography, imaging through scattering media, compressed sensing, and non-line-of-sight imaging.
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2024
Learning Outcomes: 1. Apply ray and wave based light propagation models
Audience: Graduate

2. Explain the process of image formation in conventional imaging systems using theory and computational models
Audience: Graduate

3. Select and combine the different components required in an imaging system to perform light manipulation, collection, and image reconstruction

Audience: Graduate

4. Apply the linear matrix and integral operators that model light propagation
Audience: Graduate

5. Apply the linear inverse algorithms that allow an imaging system to reconstruct properties of the scene from collected data
Audience: Graduate

6. Simulate different computational imaging systems and perform computation on simulated datasets
Audience: Graduate

7. Understand the most common computational imaging techniques and be able to use and adapt them for their own applications
Audience: Graduate

MED PHYS/B M E/CHEM 750 – BIOLOGICAL OPTICAL MICROSCOPY
3 credits.

Covers several aspects of state-of-the-art biological and biophysical imaging with an emphasis on instrumentation, beginning with an overview of geometrical optics and optical and fluorescence microscopy. The bulk of the course will focus on advanced imaging techniques including nonlinear optical processes (multi-photon excitation, second harmonic generation, and stimulated Raman processes) and emerging super-resolution methods. Special emphasis will be given to current imaging literature and experimental design. Knowledge of physics-based optics [such as PHYSICS 202] strongly recommended.
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2021
Learning Outcomes: 1. Provide a clear, concise oral presentation critiquing a paper in the literature
Audience: Graduate

2. Write a hypothesis driven research proposal and present an oral defense
Audience: Graduate

3. Write a critical written assessment of literature papers
Audience: Graduate

4. Use course concepts to better design experiments and extract quantitative information
Audience: Graduate

5. Articulate a fundamental understanding of the function of a microscope

Audience: Graduate

MED PHYS 770 – ADVANCED BRACHYTHERAPY PHYSICS
3 credits.

The use of radioactive sources for radiotherapy including: materials used, source construction dosimetry theory and practical application, dosimetric systems, localization and reconstruction. Covers low dose rate, high dose rate and permanently placed applications.
Requisites: MED PHYS/B M E 566
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2026
Learning Outcomes: 1. Demonstrate an understanding of common brachytherapy source isotopes, including energy, source construction, and half-life, as well as their clinical use in the treatment of gynecological, breast, prostate, and other cancer types.
Audience: Graduate

2. Create clinical treatment plans for gynecological, breast, and prostate brachytherapy treatments.
Audience: Graduate

3. Explain and understand each component of the TG-43 brachytherapy dose calculation formalism
Audience: Graduate

4. Gain familiarity with HDR afterloaders and the required quality assurance
Audience: Graduate

5. Demonstrate an understanding of LDR brachytherapy concepts including safe source handling, calibration, and quality assurance
Audience: Graduate

6. Understand radiation protection concepts relevant to brachytherapy including state/national regulations and the components of a quality management program for brachytherapy
Audience: Graduate

MED PHYS 772 — ADVANCED RADIATION TREATMENT PLANNING
3 credits.

Physics of clinical, computer-based radiotherapy planning is taught. Topics include dose algorithms, measurement data, commissioning, contouring and volume definition, beam placement, modifiers and apertures and plan evaluation. Forward based and inverse planning (including IMRT optimization) are taught.
Requisites: MED PHYS/B M E 566 and graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Design simple and intermediate forward-based photon and electron external beam plans using beam arrangements/energy, wedges and blocks intelligently with regards to underlying physics
Audience: Graduate

2. Create target and region at risk planning volumes, setup objectives for, and optimize, inverse planned intensity modulated plans.
Audience: Graduate

3. Evaluate dose distributions using a variety of metrics.
Audience: Graduate

4. Understand beam model commissioning process and limitations including data requirements and processing.
Audience: Graduate

5. Understand dose algorithms used in radiation therapy (including but not limited to: convolution superposition, Monte Carlo, pencil beam.)
Audience: Graduate

MED PHYS 775 — ADVANCED ULTRASOUND PHYSICS
3 credits.

Mathematical and physical foundations of the application of acoustics in diagnostic ultrasound. Derivation of wave equations for mechanical waves in fluids and solids from a continuum mechanics perspective. Diffraction theory and methods for acoustic field calculation (analytic, angular spectrum, simulations). Review of interactions of acoustic waves with biological tissue and methods to measure their acoustic properties. In-depth discussion of methods for structural image formation including ray-line scanning, plane wave compounding, synthetic aperture, coded excitation, and spatial coherent imaging. Introduction to novel functional imaging approach, including ultrafast Doppler, molecular ultrasound, functional ultrasound, and super-resolution imaging. Application of the acquired knowledge to perform a systematic literature review of the state-of-the-art of the field for the solution of a relevant clinical problem.
Requisites: B M E/MED PHYS 573 and 578
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2024
Learning Outcomes: 1. Provide detailed physical explanations, based on advanced mathematical grounds, of (a) the basic principles of the propagation and interactions of mechanical waves in tissues, and (b) several ultrasound-based structural and functional imaging techniques
Audience: Graduate

2. Critically assess recent technological developments in medical ultrasound imaging by appraising the motivation, strengths, and limitations of published research in this area
Audience: Graduate

3. Based on a critical review of the state of the art of biomedical ultrasound, define the goal and specific aims of a research proposal focused on addressing a knowledge gap in the field and/or solving a relevant clinical problem using advanced concepts of ultrasound image acquisition, formation, and processing
Audience: Graduate

MED PHYS 777 — PRINCIPLES OF X-RAY COMPUTED TOMOGRAPHY
3 credits.

Understand the basic principles of x-ray computed tomography (CT), and how to think when a technical problem arises in CT. Accomplished through a review of the history of CT developments and key components of CT systems, lectures on various CT reconstruction algorithms, image quality, and radiation dose, origin and correction methods of various CT artifacts.
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Understand the basic principles of x-ray CT imaging systems
Audience: Graduate

2. Understand the mathematical foundation of basic CT reconstruction algorithms
Audience: Graduate

3. Be able to implement filtered backprojection (FBP) reconstruction algorithms for various CT geometries
Audience: Graduate

4. Understand CT image quality metrics and their dependence on CT system properties
Audience: Graduate

5. Understand the physical origin of common CT image artifacts and the corresponding correction methods
Audience: Graduate

MED PHYS/B M E/E C E 778 — MACHINE LEARNING IN ULTRASOUND IMAGING
3 credits.

Concepts and machine learning techniques for ultrasound beamforming for image formation and reconstruction to image analysis and interpretation will be presented. Key machine learning and deep learning concepts applied to beamforming, compressed sampling, speckle reduction, segmentation, photoacoustics, and elasticity imaging will be evaluated utilizing current peer-reviewed publications.
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2025
Learning Outcomes: 1. Critically read and evaluate peer-reviewed journal papers describing machine learning applications in ultrasound imaging.
Audience: Graduate

2. Apply, implement and expand upon ideas from these publications to applications in ultrasound imaging.
Audience: Graduate

3. Present the results of their critical evaluation and implementation to the class.
Audience: Graduate

4. Write a research paper based on their findings suitable for publication.
Audience: Graduate

MED PHYS 780 — PHARMACOKINETIC MODELING IN BIOMEDICAL IMAGING
2 credits.

Concepts and techniques of pharmacokinetic modeling will be presented in the context of biomedical imaging. Examine applications in various specialties, e.g. neurology and oncology, using different imaging tools, e.g. positron emission tomography (PET) and magnetic resonance imaging (MRI).
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2020
Learning Outcomes: 1. Understand fundamental principles of pharmacokinetic modeling within the context of biomedical imaging
Audience: Graduate

2. Implement appropriate mathematical models for given biological tracer systems
Audience: Graduate

3. Apply these skills to biomedical research questions
Audience: Graduate

4. Analyze biomedical imaging data to investigate pharmacokinetic properties
Audience: Graduate

5. Create a publication quality research paper
Audience: Graduate

MED PHYS 900 — JOURNAL CLUB AND SEMINAR
1 credit.

Provides medical physics graduate students with the opportunity to critically evaluate and report on published research and/or research seminar presentations by speakers, from both within the university and from the larger scientific community.
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2026
Learning Outcomes: 1. Understand the various areas of Medical Physics given in seminars
Audience: Graduate

2. Explore the subject of a seminar and understand medical terms
Audience: Graduate

MED PHYS 990 — RESEARCH
1-12 credits.

Provides graduate students with mentorship to support their development of independent research goals and methods needed to address specific scientific problems that will result in a comprehensive dissertation.
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2026
Learning Outcomes: 1. Conduct independent and focused research using a variety of approaches.
Audience: Graduate

2. Analyze and think critically to address research challenges.
Audience: Graduate

3. Exhibit and foster professional and ethical conduct in their research.
Audience: Graduate

4. Collaborate with other investigators within or outside their lab.
Audience: Graduate