

# RADIOLOGY

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Courses offered by the Department of Radiology have the subject code RAD, and are listed in the "Radiology (RAD) Courses" section of this bulletin.

The Department of Radiology does not offer degrees; however, its faculty teach courses open to medical students, graduate students, and undergraduates. The department also accepts students in other curricula as advisees for study and research. Undergraduates may also arrange individual research projects under the supervision of the department's faculty. This discipline focuses on the use of radiation, ultrasound, and magnetic resonance as diagnostic, therapeutic, and research tools. The fundamental and applied research within the department reflects this broad spectrum as it relates to anatomy, pathology, physiology, and interventional procedures. Original research and development of new clinical applications in medical imaging is supported within the Radiological Sciences Laboratory.

## RADIOLOGY (RAD) COURSES

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For information on graduate programs in Radiology, see the "Radiology" section of this bulletin.

### UNDERGRADUATE COURSES IN RADIOLOGY

#### **RAD 101. Readings in Radiology Research**

Prerequisite: consent of instructor.

*1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)*

#### **RAD 199. Undergraduate Research**

Students undertake investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

*1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)*

### GRADUATE COURSES IN RADIOLOGY

Primarily for graduate students; undergraduates may enroll with consent of instructor.

#### **RAD 208. Experimental Nuclear Medicine**

Computer applications in medicine, particularly in the use of radioisotopes as tracers. Recommended: some knowledge of physiology and calculus.

*2 units, Win (Goris, M)*

#### **RAD 220. Imaging Anatomy**

(Same as BIOE 220.) The physics of medical imaging and human anatomy through medical images. Emphasis is on normal anatomy, contrast mechanisms, and the relative strengths of each imaging modality. Labs reinforce imaging techniques and anatomy. Prerequisites: basic biology, physics.

*3 units, Win (Gold, G; Pauly, K)*

#### **RAD 222A. Multimodality Molecular Imaging in Living Subjects I**

(Same as BIOE 222A.) Instruments for imaging molecular and cellular events in animals and human beings using novel assays. Instrumentation physics, chemistry of molecular imaging probes, and applications to preclinical models and clinical disease management.

*4 units, Aut (Gambhir, S; Rao, J)*

#### **RAD 222B. Multimodality Molecular Imaging in Living Subjects II**

(Same as BIOE 222B.) In vivo imaging techniques and applications to preclinical models and clinical disease management. Focus on cancer research, neurobiology, cardiovascular and musculoskeletal diseases.

*2 units, Win (Gambhir, S; Rao, J)*

#### **RAD 226. In Vivo Magnetic Resonance Spectroscopy and Imaging**

Collections of identical independent nuclear spins are described by the classical vector model of magnetic resonance imaging (MRI); however, interactions among spins, as occur in many in vivo processes, require a more complete description. Physics and engineering principles of these in vivo magnetic resonance phenomena with emphasis on current research questions and clinical applications. Topics: quantum mechanical description of magnetic resonance, density matrix theory, product operator formalism, relaxation theory and contrast mechanisms, spectroscopic imaging, spectral editing, and multinuclear studies. Prerequisites: EE 369B or familiarity with magnetic resonance, working knowledge of linear algebra.

*3 units, Win (Spielman, D)*

#### **RAD 227. Functional MRI Methods**

(Same as BIOPHYS 227.) Basics of functional magnetic resonance neuroimaging, including data acquisition, analysis, and experimental design. Journal club sections. Cognitive neuroscience and clinical applications. Prerequisites: basic physics, mathematics. Recommended: neuroscience.

*3 units, not given this year*

#### **RAD 228. Magnetic Resonance Imaging Programming Topics**

Primarily for students working on research projects involving MRI pulse sequence programming. Introductory and student-initiated topics in seminars and hands-on labs. Image contrast mechanisms achieved by pulse sequences that control radiofrequency and gradient magnetic fields in real time, while acquiring data in an organized manner for image reconstruction. Prerequisites: EE 369B and consent of instructor.

*3 units, Sum (Hargreaves, B)*

#### **RAD 299. Directed Reading in Radiology**

Prerequisite: consent of instructor.

*1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)*

#### **RAD 399. Graduate Research**

Students undertake investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

*1-18 units, Aut (Staff), Win (Staff), Spr (Staff), Sum (Staff)*