BIOMEDICAL IMAGING (BIOMED IMG)

Course List

BIOMED IMG 200 Professionalism in the Academic Medical Center (0-1 Units)

Offered In: Fall, Winter
Instructor(s): David Saloner
Prerequisite(s): None

Restrictions: If not a registered MSBI student, by consent of the instructor

Activities: Lecture, Seminar

This course will provide an overview of elements of professional behavior in the conduct of clinical and research imaging studies. Issues around the ethical conduct of research; authorship; data management; interpersonal engagement; and preparation and presentation of research results will be discussed in the context of the Academic Medical Center. The course will include hour long seminars, participation in monthly research forums and in the Departmental Annual Research Symposium.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? No
Course Grading Convention: P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory), In Progress (IP, SP/UP) grading allowed
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 201 Principles of Magnetic Resonance Imaging (4 Units)

Offered In: Fall
Instructor(s): Peder Larson
Prerequisite(s): None

Restrictions: Not open to students who have passed BIOENGR 240. If not enrolled in Master's of Science in Biomedical Imaging (MSBI) program then students must obtain instructor approval.

Activities: Lecture

This introductory course aims to teach the basic principles behind magnetic resonance imaging (MRI). It will cover the physical principles of magnetic resonance, image formation, and image reconstruction, MRI hardware, contrast generation, and common artifacts. Cross-listed with BIOENGR 240.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 202 Physical Principles of CT, PET, and SPECT Imaging (4 Units)

Offered In: Fall
Instructor(s): Youngho Seo
Prerequisite(s): None

Restrictions: None

Activities: Lecture

This course is designed to build the basic knowledge base to understand the physical principles of x-ray computed tomography (CT), positron emission tomography (PET), and single photon emission computed tomography (SPECT). Using examples of CT, PET, and SPECT used in everyday disease management, we will introduce theoretical foundations and practical applications for comprehensive understanding of these important noninvasive imaging techniques.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 203 Imaging Probes for Nuclear and Optical Imaging (3 Units)

Offered In: Winter
Instructor(s): Henry Vanbrocklin
Prerequisite(s): Biomedical Imaging 202

Restrictions: None

Activities: Lecture

This course will cover all aspects of probe development for Optical, PET and SPECT imaging. The following topics will be highlighted: the fundamental principles of PET, SPECT and optical imaging, isotope production, chemistry of PET, SPECT and optical imaging agents, molecular imaging in cell and molecular biology and applications of molecular imaging in normal tissue and disease characterization as well as drug development.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? No
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 204 Principles of Diagnostic and Therapeutic Ultrasound (2 Units)

Offered In: Winter
Instructor(s): David Saloner
Prerequisite(s): Admission to the course is by permission of the instructor.

Restrictions: Registration in the Master's of Science in Biomedical Imaging program at UCSF or by permission of the instructor, generally to students with an undergraduate degree in the basic sciences or engineering.

Activities: Lecture

This course will introduce the physical principles of ultrasound and its interaction with tissue. Ultrasound hardware and imaging modes, including Doppler flow imaging, will be explored and demonstrated through real world examples. Therapeutic ultrasound will subsequently be introduced. Topics will include the effects of ultrasound and heating on tissue, acoustic modeling, bioheat transfer, treatment monitoring and feedback control.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 205 Imaging Study Design (3 Units)

Offered In: Spring
Instructor(s): Susan Noworolski
Prerequisite(s): BIOMED IMG 201, BIOMED IMG 202, BIOMED IMG 260

Restrictions: None

Activities: Lecture, Project

This course will introduce principles of clinical study design as they apply to imaging studies for disease screening, diagnosis and treatment assessment. Topics will address statistical design, imaging methodologies, technology standardization and quality assessment, patient recruitment and coordination of clinical care, regulatory issues and cost factors. These considerations will be compared for studies using different imaging modalities and for application in different disease systems.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 209 Imaging Laboratory MR, CT, PET, & SPECT (2 Units)

Offered In: Fall
Instructor(s): Youngho Seo, An Vu
Prerequisite(s): None

Restrictions: If not enrolled in Master's of Science in Biomedical Imaging (MSBI) program, students must obtain instructor approval.

Activities: Lecture, Lab science

This laboratory course accompanies two core lecture courses BIOMED IMG 201 and BIOMED IMG 202 that are offered in the same quarter. Basic operational techniques of MR, CT, PET, and SPECT will be covered in this course. The data from the laboratory will be analyzed for the investigations of basic scanner performance parameters. Laboratory reports will be required.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 211 MR Pulse Sequences (3 Units)

Offered In: Spring
Instructor(s): Jeremy Gordon
Prerequisite(s): BIOMED IMG 201; Basic Programming skills in C

Restrictions: None

Activities: Lecture

This course will focus on the practical implementation of the basic MR principles acquired in BIOMED IMG 201. During the course, a basic MR pulse sequence will be developed using the GE programming language EPIC. Every week, there will be one lecture with an introduction to a module and one session at the scanner implementing this module. At the end of the course, the participant should be familiar with all parts of the scanner and should be able to run and modify pulse sequences.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 215 Supervised Research (3 Units)

Offered In: Spring, Summer
Instructor(s): Staff
Prerequisite(s): None

Restrictions: None

Activities: Independent Study

This independent study program is aimed at providing students in the Master's of Science in Biomedical Imaging (MBI) program an opportunity to perform research in an established imaging research laboratory. The course is offered in the spring quarter of the MBI program and will allow students to apply imaging concepts in a practical setting. Students will work under the supervision of a faculty member and undertake independent research of a scope that can be achieved within 10 weeks.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? Yes
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? Yes

BIOMED IMG 220 Advanced Neurological Imaging (3 Units)

Offered In: Spring
Instructor(s): Yan Li
Prerequisite(s): Familiarity with the material in BIOMED IMG 201.

Restrictions: If not enrolled in Master's of Science in Biomedical Imaging (MSBI) program then students must obtain instructor approval.

Activities: Lecture, Project

This course on advanced Neurological imaging will introduce state of the art quantitative techniques used for diagnoses, clinical trials, and in neuroscience studies of the brain. The course will include structural and functional brain mapping techniques including morphometric analysis, diffusion MRI fiber tracking, functional MRI, perfusion MRI, MR relaxometry, and Magnetization Transfer Ratio, Diffusion Tensor, Phase and MR Spectroscopic Imaging.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 230 Cardiovascular Imaging (3 Units)

Offered In: Winter
Instructor(s): David Saloner
Prerequisite(s): none

Restrictions: none

Activities: Lecture

The course covers the use of the major imaging modalities employed to assess the cardiovascular system in health and disease. Limitations and capabilities of different modalities will be discussed. Imaging requirements for evaluating common diseases encountered clinically will be presented. The course will cover the underlying principles of each modality as they are relevant to cardiac and vascular imaging; elements of image acquisition; and data postprocessing.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 260 Image Processing and Analysis I (2 Units)

Offered In: Fall
Instructor(s): Daehyun Yoon
Prerequisite(s): Mathematical background and computer programming experience is strongly recommended.

Restrictions: For Master of Science in Biomedical Imaging students. Open to other students at the discretion of the course instructor, space permitting.

Activities: Lecture

This course covers basic digital image processing techniques used for the analysis of biomedical images. Topics include fourier transforms, spatial and frequency domain filtering, image segmentation and statistical methods used to analyze biomedical images. The course grade is based on homework, in-class quizzes, a final exam, and a project that requires students to demonstrate their understanding of image processing techniques using the Matlab programming environment.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 260B Image Processing and Analysis I (2 Units)

Offered In: Fall
Instructor(s): Daehyun Yoon
Prerequisite(s): Mathematical background and computer programming experience is strongly recommended.

Restrictions: For Master's of Science in Biomedical Imaging students. Open to other students at the discretion of the course instructor and space permitting.

Activities: Lecture

This course covers basic digital image processing techniques used for the analysis of biomedical images. Topics include fourier transforms, spatial and frequency domain filtering, image segmentation and statistical methods used to analyze biomedical images. The course grade is based on homework, in-class quizzes, a final exam, and a project that requires students to demonstrate their understanding of image processing techniques using the Matlab programming environment.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? Yes
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 265 Image Processing and Analysis II (3 Units)

Offered In: Winter
Instructor(s): Melanie Morrison
Prerequisite(s): BIOMED IMG 260 or equivalent

Restrictions: If not enrolled in Master's of Science in Biomedical Imaging (MSBI) program then students must obtain instructor approval.

Activities: Lecture, Project, Web work, Lab skills

This course is a continuation of BIOMED IMG 260 in the Fall Quarter (Image Processing and Analysis I) and features advanced image processing techniques that are commonly performed in the field of medical imaging including arithmetic and advanced morphology analysis, registration, quantitative mapping and MR spectroscopic processing. There will be one lecture and one lab session each week. Background theory will be introduced and hands on image processing will be performed.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 270 Cancer Imaging (3 Units)

Offered In: Spring
Instructor(s): Renuka Sriram
Prerequisite(s): BIOMED IMG 201, BIOMED IMG 202, BIOMED IMG 203, BIOMED IMG 204

Restrictions: None

Activities: Lecture

The course will build on the basics taught in the core imaging courses and address the application of imaging methods to inform on cancer. Biological aspects of the disease that lend themselves to anatomic, functional, metabolic and molecular imaging will be presented. The use of established and emerging approaches to image cancer in cell, tissue and animal models will be taught. Major cancer types and the imaging methods commonly used in the clinic will then be introduced by UCSF clinicians.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? No
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 280 Musculoskeletal, Abdominal, and Pelvic Imaging (3 Units)

Offered In: Spring
Instructor(s): Susan Noworolski, Galateia Kazakia
Prerequisite(s): Familiarity with the material in BIOMED IMG 201.

Restrictions: None

Activities: Lecture

This course will focus on imaging of the body, including organs and tissues in the abdomen, the pelvis, and the musculoskeletal system. It will build on the fundamental principles developed in the core imaging courses. Particular challenges of imaging the body will be covered along with methods to address them. Quantitative imaging metrics of tissue composition and function will be covered as well as clinical applications.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? No
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: Letter Grade
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? No

BIOMED IMG 298 Thesis (6 Units)

Offered In: Summer
Instructor(s): Staff
Prerequisite(s): BIOMED IMG 215

Restrictions: Requires approval of thesis topic.

Activities: Independent Study

Students in the Master's of Science in Biomedical Imaging (MSBI) program will have the option to undertake a thesis project at the completion of their course work. This research project will be performed under the supervision of a faculty member and the thesis topic will require pre-approval.

School: Graduate Division
Department: Biomedical Imaging Program
May the student choose the instructor for this course? Yes
Does enrollment in this course require instructor approval? Yes
Course Grading Convention: P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)
Graduate Division course: Yes
Is this a web-based online course? No
Is this an Interprofessional Education (IPE) course? No
May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course? Yes
Repeat course for credit? Yes