# BIOMEDICAL IMAGING (MS)

Visit program website. (https://radiology.ucsf.edu/education/graduate-programs/msbi-program/)

**Degree Offered:** MS
**Program Leadership:**
Youngho Seo, PhD, Program Director
Susan Noworolski, PhD, Director of Graduate Studies
**Admissions Inquiries:**
Mike Leon, Program Administrator

## Program Description

The Master of Science in Biomedical Imaging (MSBI) program is intended for students with bachelor's degrees, advanced pre-doctoral students, postdoctoral fellows, residents, researchers and faculty members who wish to master biomedical imaging and research methods to enhance their research designs and broaden their investigative projects.

The UCSF MSBI Program is one of the first of its kind in the United States. It is unique in terms of the breadth and depth of subject matter conveyed over a relatively short period of time. MSBI graduates may matriculate through the program in either three or four 10-week academic quarters.

### Faculty

The MSBI Faculty comprises 13 assistant, associate and full professors who are part of the UCSF Department of Radiology and Biomedical Imaging. In addition, throughout any academic quarter, several guest lecturers from the department, as well as from other departments at UCSF are invited to offer lectures and share expertise in any core course or elective.

### Research Areas

- Cancer imaging
- Neurological imaging
- Musculoskeletal imaging
- Abdominal/pelvic imaging
- Nuclear-optical imaging
- Image processing and analysis
- Imaging study design
- Diagnostic and therapeutic ultrasound
- Radiopharmaceutical probes
- MR pulse sequence development

### Career Outcomes

Graduates of the MSBI program have continued on a variety of paths since graduation. These include: medical school, doctoral programs, internships and employment in academic labs, as well as internships and employment in industry.

The MSBI program office is located at the UCSF China Basin campus, where the majority of the MSBI program lectures and labs are also convened. Some labs are convened offsite (e.g., at UCSF Mission Bay Campus and the Veterans' Administration Medical Center in San Francisco).

The Biomedical Imaging MS program is offered by the UCSF Division of Graduate Education and Postdoctoral Affairs. The program is administered by the UCSF Department of Radiology and Biomedical Imaging and delivered by faculty members in the Department of Radiology and Biomedical Imaging.

## Admission Requirements

- Undergraduate degree in basic sciences or engineering
- Statement of research experience (1 page limit)
- Statement of Purpose (1 page limit)
- Two letters of recommendation
- English proficiency metric (i.e. TOEFL/IELTS) for foreign applicants
- Description of education in mathematics and computer science (1 page limit) - recommended

## Learning Outcomes

- Knowledge about the fundamentals of medical image formation and analyses
- Hands-on experience with imaging equipment and analyses
- Knowledge about applications of medical imaging to characterize pathologies, to monitor response to therapies and to assess underlying biology

## Additional Information

### Program Faculty

- *Find a* program faculty list *(*https://radiology.ucsf.edu/education/graduate-programs/msbi-program/people/*) on the program website.*

### Career Outcomes

- *Find* career outcomes and other data on Master's programs *(*https://graduate.ucsf.edu/admission/graduate-program-statistics/bioimaging-statistics/*) on the Graduate Education and Postdoctoral Affairs website.*

## Degree Requirements

- Minimum GPA of 3.0
- Minimum of 36 units
- All core courses and required activities taken and passed
- Pass comprehensive examination **or** completion and submission of a master's thesis (students should consult with their program for specific requirements).
- For additional details, please see: graduate.ucsf.edu/masters-degree (https://graduate.ucsf.edu/masters-degree/)

## Core Courses

| Course | Title | Units |
|---|---|---|
| **Fall** | | |
| BIOMED IMG 200 | Professionalism in the Academic Medical Center | 1 |
| BIOMED IMG 201 | Principles of Magnetic Resonance Imaging [1] | 4 |
| BIOMED IMG 260 | Image Processing and Analysis I [1] | 2 |
| BIOMED IMG 202 | Physical Principles of CT, PET, and SPECT Imaging [2] | 4 |
| BIOMED IMG 209 | Imaging Laboratory MR, CT, PET, & SPECT [2] | 2 |
| | **Units** | **13** |
| **Winter** | | |
| BIOMED IMG 265 | Image Processing and Analysis II [1] | 3 |
| BIOMED IMG 203 | Imaging Probes for Nuclear and Optical Imaging [2] | 3 |
| BIOMED IMG 204 | Principles of Diagnostic and Therapeutic Ultrasound | 2 |
| | **Units** | **8** |

| | Spring | | |
|---|---|---|---|
| BIOMED IMG 205 | Imaging Study Design | | 3 |
| | **Units** | | **3** |
| | **Total Units** | | **24** |

[1] Recommended year 1 if part-time
[2] Recommended year 2 if part-time

## Approved Electives

| Code | Title | Units |
|---|---|---|
| **Winter** | | |
| BIOMED IMG 211 | MR Pulse Sequences | 3 |
| BIOMED IMG 230 | Cardiovascular Imaging | 3 |
| BIOENGR 241 | Metabolism and Magnetic Resonance Spectroscopy | 3 |
| **Spring** | | |
| BIOMED IMG 215 | Supervised Research | 3 |
| BIOMED IMG 220 | Advanced Neurological Imaging | 3 |
| BIOMED IMG 270 | Cancer Imaging | 3 |
| BIOMED IMG 280 | Musculoskeletal, Abdominal, and Pelvic Imaging | 3 |
| BIOENGR 245 | Machine Learning Algorithms for Medical Imaging | 3-4 |

# Non-course Core Requirements

- Introductory Programming Bootcamp
- Plan I (thesis) students must pass a qualifying examination