BIOMEDICAL IMAGE COMPUTING, MS

for the degree of Master of Science in Biomedical Image Computing

The M.S. in Biomedical Image Computing blends together the fields of biomedical imaging science and machine learning. Students will receive a rigorous training in imaging systems and analysis, computational imaging, and machine learning, in preparation for an industry career.

Department Research
Bioengineering faculty perform research in the areas of Bio-Imaging at Multi-Scale, Molecular, Cellular and Tissue Engineering, Bio-Micro and Nanotechnology, Computational and Systems Bioengineering, and Synthetic Bioengineering. In addition to Bioengineering faculty, the Department of Bioengineering has more than 50 affiliate faculty (http://bioengineering.illinois.edu/directory/).

The Department of Bioengineering offers studies leading to the Master of Engineering in Bioengineering (MEng), the Master of Science in Bioengineering (MS), the Master of Science in Biomedical Image Computing (MS in BIC), and the Doctor of Philosophy (PhD) in Bioengineering. The Bioengineering Graduate Program provides students with educational and research experiences that integrate the sciences of biology and medicine with the practices and principles of engineering. For the MS and PhD programs, areas of focus include Bio-Imaging at Multi-Scale, Molecular, Cellular and Tissue Engineering, Bio-Micro and Nanotechnology, Computational and Systems Bioengineering, and Synthetic Bioengineering.

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<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BIOE 483</td>
<td>Biomedical Computed Imaging Systems</td>
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<td>BIOE 484</td>
<td>Statistical Analysis of Biomedical Images</td>
<td>4</td>
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<td>BIOE 485</td>
<td>Computational Mathematics for Machine Learning and Imaging</td>
<td>4</td>
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<td>BIOE 486</td>
<td>Applied Deep Learning for Biomedical Imaging</td>
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<td>BIOE 488</td>
<td>Applied High-Performance Computing for Imaging Science</td>
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<td>BIOE 489</td>
<td>Regulations, Ethics and Logistics in Biomedical Applications of Machine Learning</td>
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<td>BIOE 580</td>
<td>Foundations of Imaging Science</td>
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<td>BIOE 588</td>
<td>Biomedical Image Computing Capstone Project Literature Review</td>
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<td>BIOE 589</td>
<td>Biomedical Image Computing Capstone Project</td>
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<td>Choose one of the following:</td>
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<td>BIOE 586</td>
<td>Deep Generative Models in Bioimaging</td>
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<td>OR</td>
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<tr>
<td></td>
<td>Approved Elective Course (see below)</td>
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Approved Elective Courses:
Advisor Approval is required for elective courses not listed below

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<tbody>
<tr>
<td>BIOE 504</td>
<td>Analytical Methods in Bioeng</td>
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<td>BIOE 505</td>
<td>Computational Bioengineering</td>
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<tr>
<td>BIOE 507</td>
<td>Advanced Bioinstrumentation</td>
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<td>BIOE 597</td>
<td>Individual Study</td>
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<td>CS 543</td>
<td>Computer Vision</td>
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<td>CS 547</td>
<td>Deep Learning</td>
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<td>ECE 513</td>
<td>Vector Space Signal Processing</td>
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<td>ECE 534</td>
<td>Random Processes</td>
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<td>ECE 543</td>
<td>Statistical Learning Theory</td>
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<td>ECE 544</td>
<td>Topics in Signal Processing</td>
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<td>ECE 547</td>
<td>Topics in Image Processing</td>
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<td>ECE 549</td>
<td>Computer Vision</td>
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<td>ECE 558</td>
<td>Digital Imaging</td>
</tr>
<tr>
<td>ECE 561</td>
<td>Statistical Inference for Engineers and Data Scientists</td>
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</table>

Information listed in this catalog is current as of 12/2022
### Admission Requirements

Applicants should have a bachelor’s degree in an engineering or other quantitative discipline from an accredited college or university. Students should have a minimum grade point average of 3.00 (A=4.00) or equivalent for the last two years of undergraduate study and show evidence of strong quantitative skills and of serious interest in imaging and machine learning through their personal statement. Students in the program do not have automatic admission to the Ph.D. program in any engineering department.

All applicants whose native language is not English must submit a minimum TOEFL score of 102 (iBT), 257 (CBT), or 613 (PBT); or minimum International English Language Testing System (IELTS) academic exam scores of 7.0 overall and 6.0 in all subsections. Applicants may be exempt from the TOEFL if certain criteria are met. Applicants with lesser scores may still apply. Limited status is granted for lesser scores and requires enrollment in English as a Second Language (ESL) courses based on an ESL Placement Test (EPT) taken upon arrival to campus.

### Financial Aid

The tuition and fees for the M.S. in Biomedical Image Computing are the standard Graduate and Professional Programs rates for the College of Engineering. Students in the M.S. in Biomedical Image Computing program are not eligible for tuition-waiver generating assistantships.

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### Graduate Programs in Bioengineering

- **Majors**
  - Bioengineering, MEng ([http://catalog.illinois.edu/graduate/engineering/bioengineering-meng/](http://catalog.illinois.edu/graduate/engineering/bioengineering-meng/))
    - concentrations
      - Bioinstrumentation ([http://catalog.illinois.edu/graduate/engineering/bioengineering-meng/bioinstrumentation/](http://catalog.illinois.edu/graduate/engineering/bioengineering-meng/bioinstrumentation/))
      - Computational Genomics ([http://catalog.illinois.edu/graduate/engineering/bioengineering-meng/computational-genomics/](http://catalog.illinois.edu/graduate/engineering/bioengineering-meng/computational-genomics/))
      - General Bioengineering ([http://catalog.illinois.edu/graduate/engineering/bioengineering-meng/general-bioengineering/](http://catalog.illinois.edu/graduate/engineering/bioengineering-meng/general-bioengineering/))
  - Bioengineering, MS ([http://catalog.illinois.edu/graduate/engineering/bioengineering-ms/](http://catalog.illinois.edu/graduate/engineering/bioengineering-ms/))
    - optional concentrations
      - Biomechanics ([http://catalog.illinois.edu/graduate/engineering/concentration/biomechanics/](http://catalog.illinois.edu/graduate/engineering/concentration/biomechanics/))
      - Cancer Nanotechnology ([http://catalog.illinois.edu/graduate/engineering/concentration/cancer-nanotechnology/](http://catalog.illinois.edu/graduate/engineering/concentration/cancer-nanotechnology/))
  - Bioengineering, PhD ([http://catalog.illinois.edu/graduate/engineering/bioengineering-phd/](http://catalog.illinois.edu/graduate/engineering/bioengineering-phd/))
    - optional concentrations
      - Biomechanics ([http://catalog.illinois.edu/graduate/engineering/concentration/biomechanics/](http://catalog.illinois.edu/graduate/engineering/concentration/biomechanics/))
      - Cancer Nanotechnology ([http://catalog.illinois.edu/graduate/engineering/concentration/cancer-nanotechnology/](http://catalog.illinois.edu/graduate/engineering/concentration/cancer-nanotechnology/))
      - Computational Science and Engineering ([http://catalog.illinois.edu/graduate/engineering/concentration/computational-science-engineering/](http://catalog.illinois.edu/graduate/engineering/concentration/computational-science-engineering/))
    - Biomedical Image Computing, MS (p. 1)

- **Concentrations**
  - Bioinstrumentation ([http://catalog.illinois.edu/graduate/engineering/bioengineering-meng/bioinstrumentation/](http://catalog.illinois.edu/graduate/engineering/bioengineering-meng/bioinstrumentation/))
    - available for:
      - Bioengineering, MEng ([http://catalog.illinois.edu/graduate/engineering/bioengineering-meng/](http://catalog.illinois.edu/graduate/engineering/bioengineering-meng/))
  - Biomechanics ([http://catalog.illinois.edu/graduate/engineering/concentration/biomechanics/](http://catalog.illinois.edu/graduate/engineering/concentration/biomechanics/))
available for:
  • Electrical & Computer Engineering, MS (http://catalog.illinois.edu/graduate/engineering/electrical-computer-engineering-ms/)
  • Electrical & Computer Engineering, PhD (http://catalog.illinois.edu/graduate/engineering/electrical-computer-engineering-phd/)
  • Materials Engineering, MEng (http://catalog.illinois.edu/graduate/engineering/materials-science-engineering-ms/)
  • Materials Science & Engineering, MS (http://catalog.illinois.edu/graduate/engineering/materials-science-engineering-ms/)
  • Materials Science & Engineering, PhD (http://catalog.illinois.edu/graduate/engineering/materials-science-engineering-phd/)
  • Mechanical Engineering, MS (http://catalog.illinois.edu/graduate/engineering/mechanical-engineering-ms/)
  • Mechanical Engineering, MEng (http://catalog.illinois.edu/graduate/engineering/mechanical-engineering-meng/)
  • Mechanical Engineering, PhD (http://catalog.illinois.edu/graduate/engineering/mechanical-engineering-phd/)
  • Computational Science and Engineering (http://catalog.illinois.edu/graduate/engineering/concentration/computational-science-engineering/)
  • Theoretical & Applied Mechanics, MS (http://catalog.illinois.edu/graduate/engineering/theoretical-applied-mechanics-ms/)
  • Theoretical & Applied Mechanics, PhD (http://catalog.illinois.edu/graduate/engineering/theoretical-applied-mechanics-phd/)
  • Cancer Nanotechnology (http://catalog.illinois.edu/graduate/engineering/concentration/cancer-nanotechnology/)

available for:
  • Electrical & Computer Engineering, MS (http://catalog.illinois.edu/graduate/engineering/electrical-computer-engineering-ms/)
  • Electrical & Computer Engineering, PhD (http://catalog.illinois.edu/graduate/engineering/electrical-computer-engineering-phd/)
  • Materials Engineering, MEng (http://catalog.illinois.edu/graduate/engineering/materials-science-engineering-ms/)
  • Materials Science & Engineering, MS (http://catalog.illinois.edu/graduate/engineering/materials-science-engineering-ms/)
  • Materials Science & Engineering, PhD (http://catalog.illinois.edu/graduate/engineering/materials-science-engineering-phd/)
  • Mechanical Engineering, MS (http://catalog.illinois.edu/graduate/engineering/mechanical-engineering-ms/)
  • Mechanical Engineering, MEng (http://catalog.illinois.edu/graduate/engineering/mechanical-engineering-meng/)
  • Mechanical Engineering, PhD (http://catalog.illinois.edu/graduate/engineering/mechanical-engineering-phd/)
  • Theoretical & Applied Mechanics, MS (http://catalog.illinois.edu/graduate/engineering/theoretical-applied-mechanics-ms/)
  • Theoretical & Applied Mechanics, PhD (http://catalog.illinois.edu/graduate/engineering/theoretical-applied-mechanics-phd/)

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Bioengineering Department
Department Head: Mark Anastasio (maa@illinois.edu)
Director of Graduate Studies: Wawrzyniec Dobrucki (dobrucki@illinois.edu)
Directors of Biomedical Image Computing: Mark Anastasio (maa@illinois.edu) and Fan Lam (fanlam1@illinois.edu)
Bioengineering Department website (https://bioengineering.illinois.edu/)
Department Faculty (https://bioengineering.illinois.edu/directory/)
Biomedical Image Computing website (https://bioengineering.illinois.edu/academics/graduate/msbic/)

Grainger College of Engineering
Grainger College of Engineering website (https://grainger.illinois.edu/)

Admissions
Departmental Admissions Requirements (https://bioengineering.illinois.edu/admissions/graduate/process-and-requirements.html)
Graduate College Admissions Requirements (https://grad.illinois.edu/admissions/apply/)

Graduate Contact
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