Graduate Programs in Biomedical Engineering

New Graduate Student Orientation
August 23, 2022

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Outline

- Program expectations
- Program degree requirements
- Course registration and advising
- Q & A!!!
- Faculty research & MS projects

- Primary resource: https://wp.wpi.edu/bme/grad/
- All inquiries: BMEGradProgram@wpi.edu
BME Administrative Staff

• **Ina Gjencaj**
  – Graduate Program
  – 4th floor
  – [igjencaj@wpi.edu](mailto:igjencaj@wpi.edu)

• **Lynda Hammett**
  – BME Department; Assistant to Department Head
  – GP 4009
  – [lhammett@wpi.edu](mailto:lhammett@wpi.edu)
Getting Around Gateway

- Access to Gateway building is open normal hours
- Lab areas always require card access
  - For access forms, see Lynda Hammett
    - MUST COMPLETE SAFETY TRAINING (access via CEMS system → Training → 8/24, 10a!)
    - [https://www.wpi.edu/offices/environmental-health-safety/laboratory](https://www.wpi.edu/offices/environmental-health-safety/laboratory)
- Visitor parking lot next to building – *but can’t park there!*
- Gateway parking lot & garage, with permit
  - [https://www.wpi.edu/offices/police/vehicle-registration-permits](https://www.wpi.edu/offices/police/vehicle-registration-permits)
- Gateway Shuttle runs to main campus during business hours
Getting Around...

• Shuttles
  – Gateway Shuttle, 7a – 6p to main campus
  – SNAP: Nightly within 1 mi, 5 or 6p til 3am, between campus locations, pharmacies, Union Station via TransLoc app
  – Price Chopper supermarket, 4 – 8p
  – South Village, 7a – 6p

• Zipcar

• bikeshare
Program Expectations

• Work more independently than undergraduate
• Original research is primary focus in thesis- and project-based graduate programs
• GPA > 3.0 to graduate
• No more than 2 C grades
• Academic Integrity
  – WPI Academic Honesty Policy
  – https://www.wpi.edu/about/policies/academic-integrity
Academic Advising

- BME core faculty
- Thesis/dissertation advisor will become your academic advisor
- “Program of Study” forms help you plan your courses and research to meet degree requirements
  - Useful tool for reviewing course selections with advisor
Course Registration

• Which courses should I take?
• How do I register for courses?
• How do I apply for graduation?
• See Registrar’s website
  – https://www.wpi.edu/offices/registrar
• See Registrar’s website for forms
  – Application for Degree
  – Course Schedules and Registration
  – Graduate Projects
Course Requirements – Master’s

- **MS (Thesis-based and Project-based Master’s Degree)**

  **Thesis-based**
  - BME: 12 credits
  - Electives: 12 credits
  - BME 599 (MS Thesis): 6 credits
  - **TOTAL**: 30 credits

  **Project-based**
  - BME: 12 credits
  - Electives: 12 credits
  - BME 597 (MS Project): 6 credits
  - **TOTAL**: 30 credits

*In addition, the following requirements must be met for both Master of Science Degree Programs*

- Technical Depth Requirements: 15 credits (grad semester = 3 credits typ.)
- Seminar (must take BME 591) *pass twice*
- BME Core Competencies (5)
  - (See grad handbook for details)
  - ✓ mathematics
  - ✓ life science
  - ✓ clinical needs analysis
  - ✓ regulation and controls
  - ✓ value creation, innovation, technology, commercialization
Course Requirements – Master’s

- MEng (Course-based Master’s Degree)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME</td>
<td>12</td>
</tr>
<tr>
<td>Life Sciences</td>
<td>3</td>
</tr>
<tr>
<td>Advanced Math</td>
<td>3</td>
</tr>
<tr>
<td>Life Sciences or Advanced Math</td>
<td>3</td>
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<tr>
<td>Electives</td>
<td>12</td>
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<tr>
<td>BME 591: Graduate Seminar (x 2)</td>
<td>12</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>33</strong></td>
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*May take directed research, but none needed*
Course Requirements – PhD

- BME 12 credits
- Life Sciences 3 credits
- Advanced Math 3 credits
- Life Science or Advanced Math 3 credits
- Electives 12 credits
- Responsible Conduct of Research 1 credit *(usually satisfied by taking BB 551)*
- Dissertation Research (BME 699) >30 credits
- BME 591: Graduate Seminar (x 4)
- Qualifying examination
- Teaching requirement
- Lab Rotations (optional)

**WPI PhD = 90 credits; 60 credits beyond MS**
(60 credit PhD students should document prior graduate-level coursework that is similar to the list above, and should consult their advisor about specific classes)
PhD Qualifying Examination

- Detailed information in the BME Graduate Program Handbook
- Must pass QE to advance to candidacy
- Taken before start of 5th semester enrolled
  - usually by summer after 2nd year
- QE committee members selected by the Graduate Studies Committee
- Qualifying Exam covers:
  - Defense of an original research proposal prepared by the student
  - Fundamental knowledge in four content areas (1 Math, 1 Life Science, and 2 BME)
Course Registration

- Register Online (Workday) for most courses
- Some BME courses require special permission (e.g., BME 562, Small Animal Surgery): waiting list?
- If a class is closed, you will need an “Add form” signed by the instructor. May be online. Suggest to contact the instructor.
Course Registration - Guidelines

• Graduate Catalog (online) lists graduate course descriptions
  – http://www.wpi.edu/academics/catalogs/grad.html

• Special Topics courses (BME595*):
  – http://wp.wpi.edu/bme/grad/

• Some courses may be offered every other year (“Cat II”, e.g. BME 550, Tissue Eng.)

• Undergraduate 4000-level courses:
  – Up to 6 credits of 4000-level courses can be taken for graduate program credit
  – Usually 7 week courses (ABCD term v. semester)
  – 1/3 unit undergraduate course = 2 credit graduate course
Independent Research Credits

• Includes Directed Research, Lab Rotations, and Thesis/Dissertation Credit

• Must be arranged individually with faculty research advisor

• Register online: http://www.wpi.edu/offices/registrar/graduate-registration.html
  - BME 598 = Directed Research
  - BME 599 = Master’s Thesis
  - BME 699 = PhD Dissertation (only after passing Qualifying Exam)

  ▪ Advisor name
  ▪ Semester (Fall or Spring)
  ▪ Number of credits (usually one course = 3 credits)
Courses – AY 22-23

• **BME (Fall 2022):**
  - **BME 530**  Biomedical Materials – A-term (2 credit) - HYBRID
  - **BME 532**  Medical Device Regulation – WEB
  - **BME 553**  Biomech Ortho Devices – IN PERSON
  - **BME 562**  Lab animal surgery (LIFE SCI) – IN PERSON
  - **BME 591**  Graduate Seminar – IN PERSON
  - **BME 593**  Scientific Communication – IN PERSON
  - **BME 595**  Special Topics: Neuroengineering – IN PERSON
  - **BME 595**  Special Topics: Medical Devices and Global Health – IN PERSON
  - **BME 595**  Special Topics: Innovation & Value Creation – IN PERSON

• **BME (Spring 2023):**
  - **BME 520**  Biomechanics and Robotics – IN PERSON
  - **BME 531**  Biomaterials in the Design of Medical Devices – IN PERSON
  - **BME 535**  Medical Device Design Controls – WEB
  - **BME 552**  Tissue Mechanics – IN PERSON
  - **BME 555**  **BioMEMS and Tissue Microengineering** - HYBRID
  - **BME 560**  Physiology for Engineers (LIFE SCI) – IN PERSON
  - **BME 580**  Biomedical Robotics – D-term (2 credit) – IN PERSON
  - **BME 591**  Graduate seminar – IN PERSON
  - **BME 595**  Special Topics: Commercial Analysis in BME - WEB
Courses – Examples

See BME Grad Handbook!

• **Life Science Requirements:**
  – BME562* Laboratory Animal Surgery (Fall)
  – BME560* Physiology for Engineers (Spring)
  – BME564* Cell and Molecular Biology for Engineers (Spring)
  – Graduate courses in biology (BBT) or biochemistry (CBC)
  *Note: these courses count as Life Science, not BME or Engineering!

• **Math Requirements:**
  – MA501 Engineering Mathematics
  – MA511 Applied Statistics for Engineers and Scientists

• **Other Engineering:**
  – Graduate (500-level) courses in Materials Science, Mechanical Engineering, Manufacturing, Chemical Engineering, Electrical Engineering, etc.

• **Other Electives:**
  – MIS576 Project Management
  – BB551 Research Integrity (1 credit seminar)
  – Business/management courses, computer science, any grad course
Application for... Graduation

• Download and fill out a “WPI Graduate Student Application for Graduation”
• Registrar’s web site – Forms/Graduate Forms/Graduate Student Application for Degree
• Must be signed by Academic Advisor and Graduate Program Director
• Note Deadlines!!!
  – You are responsible, don’t wait for your advisor or the department to tell you
Expectations & Advice

• Nothing worth having comes easily.
• Keep your eyes on the prize.
• Follow through to tangible milestones.
• Socialize and build friendships and work colleagues.
• Difficult experiences are learning experiences.
• Hang in there. It will get tough, and will get better!
• Best students will feel the most pressure.
• Perhaps, this is one of the last times for undeterred learning and exploration.
• Consider every opportunity and take advantage.
• Ask for help, but be mindful of others
Financial Aid, Fellowships

• Apply for graduate funding if eligible!
  — Gives you flexibility: conference travel, research directions, materials, etc.
  — Great for your CV!
  — Lists available on.... https://wp.wpi.edu/bme/grad

• BS/MS – consider your courses to ensure maintaining status required for financial aid

• TA, PLA opportunities
BME Community

• Get involved! Build your network
  – BMES Chapter, officers
  – Local meetings
  – BME and Gateway “Happy Hours”
BME Faculty

• Primary Faculty: Kristen Billiar, Department Head
  Taimoor Afzal
  Diana Alatalo
  Dirk Albrecht
  Sakthikumar Ambady
  Funmi Ayobami
  Jeannine Coburn
  Brent Faber
  Songbai Ji
  Adam Lammert
  Solomon Mensah
  Ray Page
  Zoe Reidinger
  George Pins
  Marsha Rolle
  Karen Troy
  Catherine Whittington
  Haichong Zhang

• BME Program Faculty - Faculty in other departments with an affiliated appointment in BME
Faculty Research

- Descriptions of faculty research on the BME Department web site (www.wpi.edu/+bme)

- Example general research areas (see WPI Grad Catalog and BME Department web site for detailed descriptions):
  - **Bioinstrumentation & Med. Devices** (Alatalo, Albrecht, Mensah, Zhang)
  - **BioMEMS and Microfluidics** (Albrecht, Billiar)
  - **Biomaterials and Tissue Engineering** (Billiar, Coburn, Mensah, Page, Pins, Rolle, Whittington)
  - **Biomechanics** (Alatalo, Billiar, Ji, Lammert, Troy)
  - **Imaging** (Alatalo, Albrecht, Ji, Troy, Zhang)
  - **Neuroscience** (Albrecht, Lammert)
Questions??

• Check FAQ’s on http://wp.wpi.edu/bme/grad!
  ─ Bookmark this!
  ─ E.g. BS/MS what to double count, etc.