Instructor: Dr. Laurence C. Bray
- E-mail: lbray2@gmu.edu
- Office: Nguyen Engineering Building, Room 3911
- Office hours: By appointment

Teaching Assistant: Ryan North
Email address: rnorth2@masonlive.gmu.edu
Office hours and location: TBD

Lectures: Monday and Wednesday: 4:30pm-5:45pm, RB 104
Recitation: Tuesday: 8:30am-9:20am, ENGR 5358

Important Notes and Dates:
- Final Exam: December 14th - 4:30pm-7:15pm
- Holidays: November 23rd – 27th (Thanksgiving)
- Reading Day: December 12th


Required software: Matlab

Course Description:
Surveys the field of bioengineering and the global impact of technology innovation in solving problems in biology and medicine with an emphasis on engineering tools and concepts. Introduces mathematical modeling and analysis of bioengineering problems through the use of standard software packages for simulation. Discusses the history, ethical/social implications, and career paths in Bioengineering.

Prerequisites: None

Requirement or Elective:
While this class may be open to all interested University students, it is a core class for the bioengineering major or associated majors.

Course Objectives:
This course will survey and familiarize students with the many facets of bioengineering.
• This course will discuss the breadth of activities and career paths in bioengineering.
• This course will explore biological systems with an emphasis on quantitative and engineering tools and concepts
• This course will illustrate the impact of bioengineering on biological research, health care, and medicine, through devices, diagnostic tools, and methods.
• This course will allow students to develop skills in using computational tools and engineering design to solve bioengineering problems.

Course Topics:
Classroom and practical experiences will be delivered via lectures and recitations that focus on: biological systems, medical imaging, biomechanics, biomaterials, neuroengineering, nanotechnology, and medical devices (e.g. 3D printing, prototyping).

Assignments and Examinations:
Quizzes: There will be several in-class quizzes.
Matlab Assignments: There will be at least four Matlab assignments.
In-class Activities: There will be at least three in-class activities.
Team Project: There will be one team project.
Exams: There will be one midterm and one final exam.

Policies:
Students will NOT be allowed to make up quizzes, assignments or examinations.

All formal assignments are to be treated as individual and not collective efforts, unless specified otherwise. A severe penalty will be given to any assignment which indicates collusion or cheating. The usual penalty for cheating is failure in the course.

Every assignment must be completed, working, and turned in. For each assignment that is not, the final grade in the course will be lowered.

All assignments will be submitted in class on the day in which they are due. Any assignments turned in after the submission deadline will receive a zero.

Grading Structure:
• The final grade will be based on (Tentative, subject to change):

<table>
<thead>
<tr>
<th>BENG 101</th>
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<tbody>
<tr>
<td>Quizzes and Attendance</td>
<td>10%</td>
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<tr>
<td>Assignments</td>
<td>20%</td>
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<tr>
<td>In-class Activities</td>
<td>15%</td>
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<tr>
<td>Midterm Exam</td>
<td>20%</td>
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<tr>
<td>Team Project</td>
<td>15%</td>
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<tr>
<td>Final Exam</td>
<td>20%</td>
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The grading scale for this course is:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
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<tbody>
<tr>
<td>97-100%</td>
<td>A +</td>
</tr>
<tr>
<td>93-97%</td>
<td>A</td>
</tr>
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<td>90-93%</td>
<td>A -</td>
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<tr>
<td>87-90%</td>
<td>B +</td>
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<tr>
<td>83-87%</td>
<td>B</td>
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<td>80-83%</td>
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<td>77-80%</td>
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<td>73-77%</td>
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<td>70-73%</td>
<td>C - *</td>
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<tr>
<td>60-70%</td>
<td>D *</td>
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<tr>
<td>0-60%</td>
<td>Failing *</td>
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* Grades of "C-" and "D" in this course are considered unsatisfactory. According to departmental policy, no C- or D in ECE, BENG, BIOL, CS or ENGR courses can be submitted for the degree in Bioengineering. You will need to repeat the course if you obtain a grade of C- or lower.

Extra Credit opportunities:
Extra credit will only be considered after final grades are calculated based on attendance or participation to the following:

- A summer research or enrichment program focused on research in bioengineering or biomedical sciences, including Aspiring Summer Scientist Internship Program (GMU) and Summer Research Fellowships at National Institutes of Health.
- Presentations of bioengineering senior design projects
- Bioengineering seminars hosted by George Mason University, a nearby University bioengineering program or regional association.

Only those students whose final grade falls within 1% point of a grade transition (for example, 82, or a B-minus) will be considered eligible for extra credit only to help assist them to the next higher grade level (83 or B).

All extra credit opportunities must be performed before December 1. Each person must declare one of these extra credit opportunities in advance that will be considered after final grades are calculated.

Attendance:

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<tr>
<th>100 points</th>
<th>80 points</th>
<th>60 points</th>
<th>40 points</th>
<th>20 points</th>
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</thead>
<tbody>
<tr>
<td>Never misses classes</td>
<td>Rarely misses classes</td>
<td>Sometimes misses classes</td>
<td>Absent for most classes</td>
<td>Rarely attends classes</td>
</tr>
<tr>
<td>Never misses recitations</td>
<td>Misses 1 recitation</td>
<td>Misses 2 recitations</td>
<td>Misses 3 recitations</td>
<td>Misses 4 recitations</td>
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GMU Policies and Resources for Students:

- Students must adhere to the guidelines of the George Mason University Honor Code [See http://academicintegrity.gmu.edu/honorcode/].
- Students must follow the university policy for Responsible Use of Computing [See http://universitypolicy.gmu.edu/all-policies/].
- Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students solely through their Mason email account.
- The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students’ personal experience and academic performance [See http://caps.gmu.edu/].
- Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See http://ods.gmu.edu/].
- Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor. The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing [See http://writingcenter.gmu.edu/].

Professional Dispositions:
- Students are expected to exhibit professional behaviors and dispositions at all times.

Core Values Commitment:
- The College of Education & Human Development is committed to collaboration, ethical leadership, innovation, research-based practice, and social justice. Students are expected to adhere to these principles. [See http://cehd.gmu.edu/values/].

WAVES: Wellness, Alcohol and Violence Education and Services:
WAVES promotes wellness within the Mason community through health education, alcohol/drug assessment and education, and violence awareness, prevention and sexual assault response. We help students make healthy, safe choices and encourage lifelong, thoughtful healthy decision-making through individualized support, creative programming, and evidence-based education and outreach.

WAVES office 703-993-9999
SUB I, Suite 3200
24-Hour Sexual and Intimate Partner Violence Crisis Line 703-380-1434
waves.gmu.edu

- 703-360-7273 (Fairfax County Office for Women and Domestic and Sexual Violence Services 25 hotline)
- 703-228-4848 (Arlington County Domestic Violence Services Hotline)
CAPS: Counseling and Psychological Services:
Counseling and Psychological Services (CAPS) provides a wide range of free confidential services to students, faculty, and staff. Services are provided by a staff of professional clinical psychologists, social workers, counselors, learning specialists, and psychiatric providers. CAPS individual and group counseling, workshops, and outreach programs are designed to enhance students’ personal experience and academic performance.
Visit us at caps.gmu.edu for additional resources.
  - For consultation or emergency assistance during office hours call 703-993-2380.
  - For assistance during non-office hours, call University Police at 703-993-4357.
  - 703-527-4077 (CrisisLink)
  - 1-800-273-8255 (National Suicide Prevention Lifeline)
  - 1-877-838-2838 (Veterans' Crisis Hotline)

Student Health Services (SHS) — Provides confidential health care to enrolled students in emergency and non-emergency circumstances on the Fairfax, Arlington and Prince William campuses. If there is a medical emergency and Student Health Services (SHS) is closed, please contact the free after-hours nurse ((703) 993-2831), a hospital emergency room, an urgent care facility, or call 911.

SUB 1, Suite 2300
703-993-2831

University Police:
Emergency: 911 Non-Emergency: (703) 993-2810
Reporting a Crime (Crime Solvers Anonymous Tip Hot-Line): (703) 993-4111
Mason Police Website: http://police.gmu.edu/
Eric Heath, Chief of Police Phone: (703) 993-3840 E-mail: eheath2@gmu.edu
BENG 101: Introduction to Bioengineering  
Fall 2016 Tentative Outline

- **Week 1 (August 29th)**
  - Class 1: Syllabus, Course outline and requirements
  - No recitation
  - Class 2: Biomolecules: Water bonding and nucleic acids

- **Week 2 (Sep 5)**
  - Class 3: *No class (Labor Day)*
  - No Recitation
  - Class 4: Cells and basic chemical transmitters

- **Week 3 (Sep 12)**
  - Class 5: Cellular communication
  - Recitation: In-class Activity 1
  - Class 6: MW1 – Scalars, vectors, variables

- **Week 4 (Sep 19)**
  - Class 7: MW2 – Matrices and programming basics
  - Recitation: Matlab Assignment 1
  - Class 8: MW3 – Relational operators and scripting

- **Week 5 (Sep 26)**
  - Class 9: MW4 – TBD
  - Recitation: Matlab Assignment 2
  - Class 10: Ethics and conduct of research

- **Week 6 (Oct 3)**
  - Class 11: Midterm Review
  - Recitation: Matlab Review
  - Class 12: Midterm Exam

- **Week 7 (Oct 10)**
  - Class 13: Cardiovascular system (Meet on Tuesday)
  - No recitation
  - Class 14: Cardiovascular system

- **Week 8 (Oct 17)**
  - Class 15: MW5 - ECG signal processing
  - Recitation: In-class Activity 2
  - Class 16: Team work and organization
• **Week 9 (Oct 24)**
  - Class 17: Prototyping
  - Recitation: Matlab Assignment 3
  - Class 18: Prototyping

• **Week 10 (Oct 31)**
  - Class 19: Ultrasound imaging
  - Recitation: 3D printing
  - Class 20: MRI imaging and signal processing

• **Week 11 (Nov 7)**
  - Class 21: MW5 – Image processing basics
  - No Recitation
  - Class 22: MW6 – Image processing

• **Week 12 (Nov 14)**
  - Class 23: Biomechanics
  - Recitation: Matlab Assignment 4
  - Class 24: Neuroengineering

• **Week 13 (Nov 21)**
  - Class 25: Bioinstrumentation
  - Recitation: In-class Activity 3
  - Class 26: **No class** (Thanksgiving)

• **Week 14 (Nov 28)**
  - Class 27: Biomaterials
  - Recitation: In-class Activity 4
  - Class 28: Microfluidics

• **Week 15 (Dec 5)**
  - Class 29: Team project presentation and prototype demonstration
  - No Recitation
  - Class 30: Team project presentation and prototype demonstration

• **Week 16 (Dec 12)**
  - Class 31: Final Review
  - Recitation: Matlab Review
  - **December 14th @ 4:30pm (Final Exam)**