Instructor:
Dr. Laurence C. Bray
- E-mail: lbray2@gmu.edu
- Phone: 703-993-2218
- Office: Nguyen Engineering Building, Room 3911
- Office hours: By appointment

Lectures:
- Friday: 11:30am-2:15pm, Nguyen Engineering Building, R B208

Important Notes and Dates:
- Final Exam: Friday, December 16
- Holidays: November 23rd – 27th (Thanksgiving)

Optional Textbook:

Course Description:
- Conception of senior design project in bioengineering and determination of feasibility of proposed project. Work includes developing preliminary design and implementation plan.

Prerequisites:
- 90 credit hours applicable to the Bioengineering Program, COMM 100.

Requirement or Elective:
- This course is a capstone design experience for bioengineering students.

Course Objectives:
- The students will be able to solve a larger comprehensive engineering problem and evaluate alternative approaches.
- Students will be able to design a system, component, and their interfaces.
- Students will be able to work on a team, organize their team, and assume different roles.
- Students will gain familiarity with engineering practice in developing a proposal, design document, implementation plan, and giving oral presentations.
Course Topics:
- Engineering design
- Teams and teaming
- Project selection
- Requirements specification and analysis
- Conceptual design
- System design
- System modeling
- Proposal preparation
- Design review
- Presentations
- Early prototyping
- Project management
- Testing

ABET Student Outcomes:
- Student will be able to design a system, component or process to meet desired needs. They will develop a satisfactory solution to stated problem, apply engineering and/or scientific principles in solving this problem, and will be able to use acquired knowledge in identifying and designing system components (“outcome c”).
- Students will function on a multi-disciplinary team. They will be able to organize the team effectively and engage in meaningful participation by team members of different knowledge and skills. Students will be able to carry projects involving multi-disciplinary aspects (“outcome d”).
- Students will be able to identify and solve engineering problems. They will formulate a problem and identify technical issues and non-technical aspects contributing to a problem solution. They will be able to analyze a problem, decompose it, and understand how the various pieces of the problem relate to each other. They will be able to evaluate their design and the success of the project based on experimental data/results (“outcome e”).
- Students will communicate effectively both orally and in writing (“outcome g”).

RS Student Learning Outcomes:

Scholarly Inquiries
- Articulate and refine the question (“inquiry 1”)
- Follow ethical principles (“inquiry 2”)
- Gather evidence appropriate to the question (“inquiry 3b”)

Scholarly Rubrics for Research and Scholarships Courses
- Justify that the project intends to be engaging and novel to a particular audience
- Take responsibility for executing the project
- Present their understandings from a scholarly perspective for a specific audience
- Demonstrate awareness of broader implications
Assignments and Examinations:

Homework Assignments: There will be a number of homework assignments. Most of these assignments will be collected and graded, but you will be informed in advance when an assignment is to be handed in.

Project Proposal: There will be one written proposal.

Projects:
- This class is based on a group project (Team of 3 to 4 students).
- A list of projects will be given at the beginning of the semester.
- Each student will give one introduction presentation (5 minutes).
- Each group will give one proposal presentation (15 minutes).
- Each group will give a final presentation (20 minutes).
- Each group will give a demonstration of their ‘functional’ prototype

Policies:
Students will NOT be allowed to make up assignments or presentations.

All formal homework 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 project must be completed, working, and turned in. For each project that is not, the final grade in the course may be lowered.

Late Submission Policy:
- All assignments will be submitted via blackboard by 5pm on the day in which they are due. [See https://mymasonportal.gmu.edu/webapps/portal/frameset.jsp]. Any assignments turned in after the submission deadline will be graded as late.
- The penalty for late assignments will be a one grade point deduction (i.e., B to C) for each day (or part thereof) following the due date (This late policy will apply to all assignments for which no application for extension has been made).

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

<table>
<thead>
<tr>
<th>BENG 492</th>
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<tbody>
<tr>
<td>Attendance/Meetings/Contribution</td>
</tr>
<tr>
<td>Homework Assignments</td>
</tr>
<tr>
<td>Written Proposal</td>
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<tr>
<td>Project Presentations</td>
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<tr>
<td>Quality of final Prototype</td>
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The grading scale for this course is:

<table>
<thead>
<tr>
<th>Percentage Range</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>
<tr>
<td>90-93%</td>
<td>A -</td>
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<tr>
<td>87-90%</td>
<td>B +</td>
</tr>
<tr>
<td>83-87%</td>
<td>B</td>
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<tr>
<td>80-83%</td>
<td>B -</td>
</tr>
<tr>
<td>77-80%</td>
<td>C +</td>
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<tr>
<td>73-77%</td>
<td>C</td>
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<tr>
<td>70-73%</td>
<td>C - *</td>
</tr>
<tr>
<td>60-70%</td>
<td>D *</td>
</tr>
<tr>
<td>0-60%</td>
<td>Failing *</td>
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</table>

* 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.

Meeting with Advisor:
- A weekly meeting with each group’s respective advisor is mandatory.
- Each meeting will comprise the presentation of few slides summarizing the weekly progress of the project.

Attendance and Class Participation:

<table>
<thead>
<tr>
<th>Points</th>
<th>Never misses classes</th>
<th>Rarely misses classes</th>
<th>Sometimes misses classes</th>
<th>Absent for most classes</th>
<th>Rarely attends classes</th>
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<tbody>
<tr>
<td>100 points</td>
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<td>80 points</td>
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<td>20 points</td>
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</table>

- Actively contributes to the project
- Semi-actively contributes to the project
- Sometimes contributes to the project
- Rarely contributes to the project
- Never contributes to the project
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
Tentative Course Outline:

- **Week 1 (Sep 2)**
  - Syllabus and Course Outline
  - Introduction to Engineering Design
  - Introduction to Students and Projects
  - **Pick a project**
  - Meeting with Advisor

- **Week 2 (Sep 9)**
  - Design Process
  - Literature Review (Theresa from Fenwick Library)
  - In-class Design Activity
  - **Team website**
  - Meeting with Advisor

- **Week 3 (Sep 16)**
  - Problem Statement
  - Objectives, functions, requirements and metrics
  - **Proposal guidelines**
  - Meeting with Advisor

- **Week 4 (Sep 23)**
  - **NO CLASS**
  - Observation of Cardiac Surgery at Inova hospital
  - Meeting with Advisor

- **Week 5 (Sep 30)**
  - **Project introduction - presentation**
  - Meeting with Advisor

- **Week 6 (Oct 7)**
  - Engineering Design Tools
  - Meeting with Advisor

- **Week 7 (Oct 14)**
  - Generating and Evaluating Design Alternatives

- **Week 8 (Oct 21)**
  - Engineering Drawings
  - Meeting with Advisor

- **Week 9 (Oct 28)**
  - **Proposal Presentation**
  - Meeting with Advisor

- **Week 10 (Nov 4)**
  - Proposal Feedback
  - Meeting with Advisor

- **Week 11 (Nov 11)**
  - Building Models and Prototypes
  - Meeting with Advisor

- **Week 12 (Nov 18)**
  - **NO CLASS**
  - Meeting with Advisor

- **Week 13 (Nov 24)**
  - **Thanksgiving – NO CLASS**

- **Week 14 (Dec 2)**
  - Final presentation – preparation
  - Meeting with Advisor

- **Week 15 (Dec 9)**
  - **Final Presentation**
  - Meeting with Advisor

- **Week 16 (Dec 16)**
  - Prototype Demonstration
  - Evaluation of each team’s “functional” prototype