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: 10:30am-12:20pm, Room ENGR 1108

Important Notes and Dates:
- Final Presentations: Friday, April 27th
- Final Demonstrations: Friday, May 4th from 11am to 1pm
- Holidays: March 12th – 18th (Spring Break)

Required Textbooks:
- None

Course Description:
Catalog:
Projects include designing and constructing hardware, writing required software, conducting experiments or studies, and testing complete system. This requires oral and written reports during the project period and at completion.

Prerequisites:
Courses:
- Senior standing, 90 credits applicable to Bioengineering, and COMM 100/101
- BENG 492, preferably in the preceding semester.

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

Course Objectives:
- Students will be able to build system components (hardware and software) and integrate them into an operational system.
- Students will be able to evaluate system performance through testing, results analysis, and comparison against requirements.
- Students will understand multi-disciplinary aspects of their projects.
• Students will be able to work on a team, organize their team, and assume different roles.
• Students will gain familiarity with engineering practice in writing progress reports, a final report, and giving oral presentations.

**Course Topics (in addition to the BENG 492 course topics):**
• Project management
• Testing and test cases
• Analysis and representation of results
• Dissemination of findings
• In-progress review
• Final report preparation
• Final presentation

**Students 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, and respect and recognize others. Students will be able to carry projects involving multi-disciplinary aspects (“outcomes d and f”).
• 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”).
• Students will be able to integrate information to benefit the society (“outcome k”).

**RS Student Learning Outcomes:**

*Scholarly Inquiries*

• Apply appropriate scholarly conventions during scholarly inquiry (“inquiry 3c”)
• Assess the validity of key assumptions and evidence (“inquiry 4a”)
• Situate the scholarly inquiry within a broader context (“inquiry 4b”)

*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, Reports, Examinations and Grading:

Homework Assignments:
- There will be a few homework assignments. Most of these assignments will be collected and graded.

Reports:
- There will be one in-progress report and one final report, which document your ongoing project and final project, respectively. Both reports will be collected and graded, but you will be informed in advance when an assignment is to be handed in. The final report will be in the form of a scientific paper – IEEE format.

Exams: No scheduled exams

Projects:
- This class is the second part of your senior design project based on a team of 3-5 students.
- All teams must have the same team members as BENG 492.
- Each group will give one in-progress presentation (15 minutes).
- Each group will give a final presentation (20 minutes).
- Each group will give a demonstration of their final design.

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.

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.

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>Attendance and website</th>
<th>5%</th>
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<tbody>
<tr>
<td>Contribution to the project</td>
<td>15%</td>
</tr>
<tr>
<td>Homework assignments</td>
<td>10%</td>
</tr>
<tr>
<td>Report(s)</td>
<td>20%</td>
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<tr>
<td>Presentations(s)</td>
<td>25%</td>
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<tr>
<td>Dissemination</td>
<td>5%</td>
</tr>
<tr>
<td>Quality of final design</td>
<td>20%</td>
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</tbody>
</table>

- The grading scale for this course is:

<table>
<thead>
<tr>
<th>97-100%</th>
<th>A +</th>
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</thead>
<tbody>
<tr>
<td>93-97%</td>
<td>A</td>
</tr>
<tr>
<td>90-93%</td>
<td>A -</td>
</tr>
<tr>
<td>87-90%</td>
<td>B +</td>
</tr>
<tr>
<td>83-87%</td>
<td>B</td>
</tr>
<tr>
<td>80-83%</td>
<td>B -</td>
</tr>
<tr>
<td>77-80%</td>
<td>C +</td>
</tr>
<tr>
<td>73-77%</td>
<td>C</td>
</tr>
<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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* 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.

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

Attendance and Class Participation:

<table>
<thead>
<tr>
<th>100 points</th>
<th>80 points</th>
<th>60 points</th>
<th>40 points</th>
<th>20 points</th>
</tr>
</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 meetings</td>
<td>Rarely misses meetings</td>
<td>Sometimes misses meetings</td>
<td>Absent for most meetings</td>
<td>Rarely attends meetings</td>
</tr>
<tr>
<td>Actively contributes to the project</td>
<td>Semi-actively contributes to the project</td>
<td>Sometimes contributes to the project</td>
<td>Rarely contributes to the project</td>
<td>Never contributes to the project</td>
</tr>
</tbody>
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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
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
Course Outline:

- **Week 1 (1/26)**
  - Class Meeting #1
  - Syllabus and Course Outline
  - Goals and requirements
  - ABET and RS designation
  - Ethics and Research Conduct

- **Week 2 (2/2)**
  - No meeting
  - HW1 assigned (Testing)

- **Week 3 (2/9)**
  - Class Meeting #2
  - Testing

- **Week 4 (2/16)**
  - No meeting
  - HW1 due

- **Week 5 (2/23)**
  - No meeting
  - HW2 assigned (Results)

- **Week 6 (3/2)**
  - Class Meeting #3
  - Analysis
  - Representation of Results

- **Week 7 (3/9)**
  - Individual Team Meeting
  - Presentation and report preparation
  - HW2 due

- **Week 8 (3/16)**
  - Spring Break – NO CLASS

- **Week 9 (3/23)**
  - In Progress Presentations
  - In Progress Reports

- **Week 10 (3/30)**
  - No meeting
  - Individual Feedback

- **Week 11 (4/6)**
  - Class Meeting #5
  - Abstract
  - Poster preparation
  - HW3 assigned (Poster)

- **Week 12 (4/13)**
  - Class Meeting #6
  - Poster Presentations
  - HW3 due

- **Week 13 (4/20)**
  - Individual Team Meeting
  - Final Report – Preparation
  - Final Presentation – Preparation

- **Week 14 (4/27)**
  - FINAL PRESENTATIONS

- **Week 15 (5/4)**
  - DEMONSTRATION OF FINAL DESIGN

- **Week 16 (5/11)**
  - FINAL REPORTS DUE

Meeting with your advisor(s) is required on a weekly basis throughout the entire semester. All class assignments should be shared with your advisor(s).