

## CS/EE/Cape/Bioe 480 – Capstone Project – Design

### Section Theme: Smart Living Space for People of All Abilities

#### Instructor: Ramana Reddy

Office: AER 252

Email: Ramana.Reddy@mail.wvu.edu

The capstone course in the Lane Department of Computer Science and Electrical Engineering is organized as a two-semester sequence. Each section of 480 has a specific theme. This section is concerned with developing a suite of technologies and applications aimed at creating Smart Living Spaces, where residents of *all abilities* can live in safety and comfort. For example, if a resident has difficulty remembering when to take medications or how to take medications, a *Smart Medication Dispenser* will be incorporated into the living space. In the lab (ESB G28), there is a mock apartment, to showcase the integrated solutions based on the technologies and applications developed in this course sequence (480 and 481). The class will be organized to mimic a *startup firm*, where individual groups may be working on specific projects, they need to meet with other groups frequently to coordinate their efforts to ensure progress towards a common goal. By this you will experience the “real-world” before you get there.

During the two semesters, you will be exposed all phases of a project: a) concept development, b) background research, c) business plan development, d) project management plan development, e) requirements specification, f) system design, implementation and testing, g) project documentation and hand-off to the “customer.”

Classroom lectures by the instructor and guest speakers are designed to emphasize the best practices including legal and ethical issues in all the phases of a project as well as prepare the students to become world-class engineering professionals.

#### CS/EE/CpE/Biom 480: 2 Hours Credit (GEF “W” Course)

**Prerequisite:** English 102 and Consent. You should take this course in your **penultimate semester**. You must submit a copy of your Graduation Eligibility Worksheet to the instructor as proof that you are qualified to take the class. *If we discover at any time that you are taking this course without having met these requirements, your name may be deleted from the class.*

#### Goals and Objectives

In this course, students will be exposed to a real-world like environment where they will be expected to work as part of a self-organized team to produce an appropriate solution for a real-world problem. The course process emphasizes realization of students’ intrinsic motivation and peer input where appropriate. This will provide an opportunity to develop several essential skills:

1. Integrative thinking – how to apply knowledge gained in different courses to the problem at hand
2. Lateral thinking - how to apply knowledge gained in solving one problem to a similar problem in a different domain
3. Working as part of a team
4. Becoming aware of the global nature of business and develop cultural sensitivity
5. Managing time
6. Systematically analyzing the problem from different perspectives
7. Developing appropriate technical documents
8. Developing communication skills
9. Learning business development skills
10. Learning how to act ethically in all situations

### **ABET Outcomes**

The following is a list of expected learning outcomes for each undergraduate program in our Department. Assignments in 480 and 481 are designed to document these outcomes.

#### **CS Student Learning Outcomes**

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

#### **Cybersecurity learning Outcomes**

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply security principles and practices to maintain operations in the presence of risks and threats.

## EE, CpE, and BSE Outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. An ability to communicate effectively with a range of audiences
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

### Textbook

**There is no designated textbook for this course. You should be able to find all the necessary information on the Web. Also, you should plan to take short online courses on specific topics as needed to make progress on your project.**

### Course Process

All activities and deliverables are designed to ensure realization of the outcomes specified above.

1. Project Selection
2. Group Formation
3. Mentor Selection
4. Project Development
5. Presentations in Class (Preliminary, Intermediate and Final)
6. Project Blog on Ecampus to document team work
7. "Idea Showcase" at the end of the semester

### Activities

1. Lectures / Discussions / Presentations
2. Group Meetings
3. Scheduled Meetings with the Instructor
4. Scheduled Meetings with the Mentor
5. Peer Review
6. Project Review with the Instructor/mentor

## Assignments

1. Vision, Background Research, and Requirements Specification – 20%
2. System Architecture and Analysis – 20%
3. Detailed System Design and Test Plans– 50%
4. Project Management Plan – 5%
5. Expo, Poster and Brochure – 5%

Group work must be documented for each assignment by clearly identifying the contributions of each member using different colors/fonts in the text. In addition, at the end of the document you should include a table summarizing the number of meetings held, absences of each member and a short summary of the contributions of each member:

Member Name	Total Number of Meetings	Number of Absences	Degree of Contribution (Range: 0 to 100)	Summary of Member Contributions
1. Bill Smith	3	2	40	Made some suggestions.
2. David Smith	3	0	100	Wrote the background section.
3. Jim Smith	3	0	100	Performed the requirements trade-off analysis.

Individual grades for each assignment will be based on the relative contributions made by each member as reported in the above table. **Each group should also record the activities contemporaneously on a Blog associated with the group on Ecampus. Significant deficiency in this documentation will result in reduction of at least one letter grade for all group members.**

### Selected Lecture Topics

1. Introduction, course rules, forming teams and discussion of potential projects
2. what it takes to be a world-class engineer
3. Requirements Specification

4. Project Management and Concept Generation
5. Functional Decomposition
6. Behavioral Models
7. Discussion of final design document – Examples, principles etc.
8. Testing
9. User Interface Design

### **Assignments**

For each assignment, detailed description, evaluation rubric, and submission deadline will be posted on the Ecampus site. The Ecampus Calendar will show deadlines for all assignments and schedule of class presentations and other related events. All submissions must be done only through Ecampus. **No hardcopies or Email attachments will be accepted. Deadlines are strictly enforced except in rare circumstances. Any assignment submitted within two days after the deadline will lose ten points. Assignments submitted after two days will receive zero points.**

**All students are urged to check the Ecampus Calendar regularly to ensure timely submission of assignments.**

### **Attendance Policy**

1. Missing a total of six classes or group meetings will result in reduction of one letter grade.
2. Missing a total of seven classes or group meetings will result in reduction of two letter grades
3. Missing a total of more than seven classes or group meetings will result in a grade of F.

### **Special Requirements for GEF-W Course**

This course (CS/EE/CpE/Biom 480) satisfies the special requirements for GEF “W” courses. In addition to the research paper, each student is expected to contribute equally to the various documents developed by the group. Each individual member should clearly identify his/her contribution in each document.

### **Special Concern Days**

WVU recognizes the diversity of its students and the needs of those who wish to be absent from class to participate in Days of Special Concern, which are listed in the Schedule of Courses. Students should notify their instructors by the end of the second week of classes or prior to the first Day of Special Concern, whichever is earlier, regarding Day of Special Concern observances that will affect their attendance. Further, students must abide by the attendance policy of their instructors as stated on their syllabi. Faculty will make reasonable accommodation for tests or field trips that a student misses as a result of observing a Day of Special Concern.

### **Academic Integrity**

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code:

[http://studentlife.wvu.edu/office\\_of\\_student\\_conduct/student\\_conduct\\_code](http://studentlife.wvu.edu/office_of_student_conduct/student_conduct_code).

Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me before the assignment is due to discuss the matter.

### **Inclusion Statement**

“The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion.

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Accessibility Services (293-6700). For more information on West Virginia University's Diversity, Equity, and Inclusion initiatives, please see <http://diversity.wvu.edu>.”

