

## **EE Senior Capstone Design Project I and II:** (EE 481 and EE 482)

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EE 481 (3.0 credit hours)

**Objectives:** Through an individualized design project, a group of students will have a complete experience in project specification development, engineering design, implementation/simulation, testing and evaluation. Students will be able to utilize the knowledge learned in one or more of the major electrical engineering disciplines such as integrated electronics, control, communication, signal processing, and electromagnetism. In this course, each project group should have achieved the following measurable results: 1) Proposal, organization, planning and budget report; 2) Design specifications; 3) Design review report; 4) Development and implementation progress report. At the end of the quarter, each group should have their initial implementation/simulation completed or at least have all the parts acquired ready for assembly. All the project groups achieved those goals will be enrolled in the next class EE482 consecutively.

**Prerequisites:** EGR 335 and at least one of the following courses: EE417, EE454, EE462, EE436, EE473, EE446, or EE473

**Class structure:** This is a project oriented class. Normally, students will work as groups of three members. Each group of students will select a project based on their interests, client's needs, and knowledge base. Based on the selected project, the student group must find a faculty advisor for the project. In addition, it may also invite an engineering mentor if the project is sponsored by a company. Each student group must have a project leader who can be appointed by the faculty advisor or elected by the group. The project leader will act as the project manager responsible for scheduling meetings, organizing documentation, watching for deadlines, executing project schedule, managing resources (budget and man power), etc. The class will have a few general meetings where all the groups meet to present their project oral reports. The scheduled class meeting will be once a week for 3 hours.

### **Class schedule:**

**1<sup>st</sup> Week:** Briefing the course information and scheduling issues. The students should start looking for potential topics for the projects and forming groups based on common interest, client's needs and knowledge base of the project. Where to look for project ideas: personal interests, client's needs (listed in the course website), talking to faculty members and engineers at government laboratories or local companies, visit related Web sites.

**2<sup>nd</sup> Week:** All the students who registered the courses should already have

1. selected their project topics,
2. formed their project groups and
3. picked up their faculty advisors/engineering mentors.

Project abstract is due on **the Monday of 3<sup>rd</sup> week** to your faculty advisor and course instructor. Project abstract shall include following information.

1. Project Title (Reflect the content of your project with a marketing/advertising spin)
2. Project group leader, group members and faculty advisor (and engineering mentor if needed).
3. Introduction to address the following questions
  - a. What is your project? What kind of problems your engineering design will solve?
  - b. How did people do in the past?
  - c. Why do you think your approach is better?
  - d. Who will buy or need it?
  - e. How do you think your project can yield profitable result?
4. Project Goals
  - a. Initial technical specifications
  - b. Final deliverables
5. Project plan
  - a. Do you have the necessary knowledge base to complete the project? Talk about the knowledge base of your team including faculty advisor and engineering mentor.
  - b. What are the potential technical difficulties of the project? How do you overcome the difficulties? Any alternatives?
  - c. What is your plan? (Layout your project schedule)
  - d. What is your budget and how do you cover the cost?

**Project portfolio:** At this point, each group should start their project portfolio which will include the project abstract as the first document. Project group meeting minutes should be kept in the project portfolio too. It serves as a common project document for the communication among the group members, faculty advisor, and course instructor. At the end of the quarter, the group will get a grade assigned to their portfolio. The portfolio could be in electronic form (such as a website or a file directory) commonly assessable to all the constituents.

**3<sup>rd</sup> Week:** Project kick off presentation is on this week. Each group has 15 minutes to present its project and answer questions and critiques.

grade scale: 0 ~ 10	Faculty advisor	Course Instructor
Project Abstract Doc	80%	20%
Presentation	50% if present	50%

This is the first batch of grades assigned. It is the group leaders responsible to collect the grades from the faculty advisor and course instructor.

**4<sup>th</sup> Week:** Detailed design specifications are due to the faculty advisor this week. The specifications should include all the performance measurements (numbers) that can be checked out at the end of project. Of course, the specifications can be modified during the course of design. All versions of specifications should be kept in the project portfolio.

grade scale: 0 ~ 10	Faculty advisor	Course Instructor
Design specifications	100%	0%

**5<sup>th</sup> and 6<sup>th</sup> Week:** The group should carry out their design and review their design methods and discuss any revisions and project progress with their faculty advisor. The group should document (in the design review document) the design methods, alternative designs, any design revisions, modifications of specifications, and key design components. At this point, each group should start assembling the parts list, allocate potential vendors, and order essential parts for the project. All the project orders will go through the Laboratory Manager of EE department, Mr. Tony Tritschler, 322RC (775-5047) or [simon.tritschler@wright.edu](mailto:simon.tritschler@wright.edu). To reduce the shipping and handling cost, each group should generate the complete list of parts at their best effort before submitting to Mr. Tritschler. All parts orders have to be approved by the faculty advisor. The group leader should work with faculty advisor to check for schedule, parts order and project progress. Design review documentation, parts list and vendor information should be included in project portfolio.

grade scale: 0 ~ 10	Faculty advisor	Course Instructor
Design review Doc.	100%	0%

**7<sup>th</sup> Week:** Design review oral presentation. Each group has 15 minutes to show their design details and progress including couple minutes for questions.

grade scale: 0 ~ 10	Faculty advisor	Course Instructor
Design review presentation	50% if present	50%

**8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> Week:** Each group should have completed their first design and start to implement their design. A midpoint progress report needs to be submitted to their faculty advisor at the end of the 10<sup>th</sup> week. The report includes the final design specifications, the design to be implemented, detailed implementation progress with all the electronic documents such as schematics, parts lists, simulation results, etc. You can also include any success stories and problems in the project progress. Also, check if the project schedule is met. The portfolio shall be well organized with a detailed table of content and shall include all of the documents submitted through out the quarter, program codes, design schematics, product photos, experimental report and data, etc. All the materials with electronic files shall be put on a CD with a “readme.txt” to explain the content. The faculty advisor will review the organization and content of the project portfolio and assign a grade to it. The portfolio will be returned to the project leader for continuous use in EE482.

grade scale: 0 ~ 10	Faculty advisor	Course Instructor
Progress report	100%	0%
Portfolio grade	100%	0%

**Final Week:** Design Project Midpoint Progress Conference will be held in the last day of the final week. Each project group will have 15 minutes to present their design and implementation progress including achievements and problems, summarize the status and schedule of their project.

grade scale: 0 ~ 10	Faculty advisor	Course Instructor
Progress oral presentation	50% if present	50%

**Students need to be present at all the general meeting entirely.** Every student will have an opportunity to evaluate the oral presentations by all the other project groups. Participation grade is based on you attendance and participation in the evaluation process.

Individual grades: A grade is assigned to every member of a project team. The grade of project leader is measured by his or her leadership performance and project outcome and is decided entirely by the faculty advisor. The grade for the individual member of the group is measured by their individual contributions to the project and is jointly decided by the faculty advisor and project leader.

grade scale: 0 ~ 10	Faculty advisor	Project leader
Leadership grade	100%	
Membership grade	50%	50%
Bonus (to only one student)	100%	

**Grades distribution:**

Part I:	Project abstract documentation	10%
Part II:	Project kick-off Presentation	10%
Part III:	Design Specifications	10%
Part IV:	Design review Documentation	10%
Part V:	Design review presentation	10%
Part VI:	Midpoint progress report	10%
Part VII:	Progress oral presentation	10%
Part VIII:	Portfolio grade	10%
Part IX:	Participation grades	10%
Part X:	Individual grades	10%
Bonus*	Each group has only one bonus assigned by the faculty advisor	5%

\* Each project team has only one bonus that will be assigned to one team member for his or her extraordinary effort. The faculty advisor will decide who, if any, should be awarded the bonus points.

EE 482 (3.0 credit hours)

**Objectives:** Through an individualized design project, a group of students will have a complete experience in project specification development, engineering design, implementation/simulation, testing and evaluation. Students will be able to utilize the knowledge learned in one or more of the major electrical engineering disciplines such as integrated electronics, control, communication, signal processing, and electromagnetism. The groups of students will continue working on their projects evolved from EE481. At the end of this course, each group will demonstrate a working product outlined in their project goal.

**Prerequisites:** EE481 (consecutively registered)

**Class structure:** Same as EE481

**Class schedule:**

**1<sup>st</sup> Week:** An informational general meeting to set motions to continue the on going projects. Each group should start design their product test experiments which can verify if the product meets the specifications or not.

**3<sup>rd</sup> Week:** By now, each group should have finished their initial implementation and their prototype product should be undergoing testing. Initial test should indicate if the product meets the specifications or not. Each group should submit a test report which includes test experiment design, testing measurement data, comprehensive specification evaluation results and design/implementation revision proposal to its faculty advisor.

grade scale: 0 ~ 10	Faculty advisor	Course Instructor
Prototype Product Testing Report	100%	

**4<sup>th</sup> Week:** Midterm project demonstration conference where each group will demonstrate their initial prototype product implementation and present their comprehensive specification evaluation results. Each project team also needs to address the revision plans and proposals to improve their design or implementation if some specifications are not met. Each group has 15 minutes for oral presentation and demonstration including questions.

grade scale: 0 ~ 10	Faculty advisor	Course Instructor
Midterm project Demonstration	50% if present	50%

**8<sup>th</sup> Week:** Progress report to address the revision and improvement made on your product is due to your faculty advisor. The report should also address your plan on how to introduce your product in the product debut meeting.

grade scale: 0 ~ 10	Faculty advisor	Course Instructor
Progress Report	100%	

A poster presentation conference is scheduled in 8<sup>th</sup> week. Each group will introduce their product in terms of functions, specifications, test results, and to market their product to potential buyers. (Demonstrations may be included if applicable.)

grade scale: 0 ~ 10	Faculty advisor	Course Instructor
Progress poster presentation	50% if present	50%

**10<sup>th</sup> Week:** Final report shall include the description of the project with complete specifications. The report provides a detailed explanation of the design with all the calculations. The development of the project should be summarized in the report. The experimental setups and data should be included in the report to show if the specifications have been met or not. The report is ended by a conclusion which summarizes the project results and future improvements.

grade scale: 0 ~ 10	Faculty advisor	Course Instructor
Final report	100%	0%

**Final Week:** Final Product Debut Conference will be held in the last day of the final week. Each project group will have 15 minutes to present and demonstrate their product including questions. After presentation, each group should turn in their project portfolio to their faculty advisor for grading. The portfolio shall be well organized with a detailed table of contents and shall include all of the documents submitted through out the quarter, program codes, design schematics, product photos, experimental report and data, etc. All the materials with electronic files shall be put on a CD with a “readme.txt” to explain the content. The project portfolio will be kept by the faculty advisor. If students want to have a copy of portfolio, they need to duplicate for themselves. The project portfolio will be evaluated by the faculty advisor.

grade scale: 0 ~ 10	Faculty advisor	Course Instructor
Final Conference presentation	50% if present	50%
Project Portfolio	100%	0%

Individual grades: This grade is assigned to every member of a project team. The grade of project leader is measured by his or her leadership performance and project outcome and is decided entirely by the faculty advisor. The grade for the individual member of the group is measured by their individual contributions to the project and is jointly decided by the faculty advisor and project leader.

grade scale: 0 ~ 10	Faculty advisor	Project leader
Leadership grade	100%	
Membership grade	50%	50%
Optional Bonus (only one student/group)	100%	

**Students need to be present for the entire general meetings.** Every student will have an opportunity to evaluate the oral presentations by all the other project groups.

Participation grade is based on your attendance and participation in the evaluation process.

grade scale: 0 ~ 10	Faculty advisor	Course Instructor
Participation		100%

**Grades distribution:**

Part I:	Prototype product testing report	10%
Part II:	Midterm project Demonstration	10%
Part III:	Progress report	10%
Part IV:	Progress presentation	10%
Part V:	Final report	10%
Part VI:	Final conference presentation	15%
Part VII:	Project portfolio	15%
Part VIII:	Individual grades	10%
Part IX:	Participation grades	10%
Bonus*	Each project group has one bonus assigned by the faculty advisor	5%

\* Each project team has one bonus that will be assigned to one team member for his or her extraordinary effort. The faculty advisor will decide who, if any, should be awarded the bonus points.