

## **SYLLABUS FOR ECE 496 - Integrated Systems Design II**

**Fall SEMESTER 2000 - <http://ece.clemson.edu/crb/ece496/>**

**INSTRUCTOR:** D.M. Dawson, Professor,

**OFFICE:** EIB 320

**TEXT:** EFFECTIVE TECHNICAL COMMUNICATION, 2nd Ed. - Clemson Staff

**COURSE DESCRIPTION:** ECE 496 is a laboratory/design project course which brings together electrical engineering students with different specialization interests to work jointly as a team on a project. (See Appendix A for details.) Each section of the class is divided into a number of groups (project teams) which independently develop and implement an engineering project in a design competition. A group leader, selected by the instructor, directs the group's efforts and maintains communication with the instructor in a manner analogous to that practiced in industry. In addition to the technical aspects of the project, an emphasis is placed on the development of effective technical communication skills, particularly oral communication competency.

**OBJECTIVES:** This course is designed to highlight the transition from academic analysis to industrial goal-oriented engineering practice. The course is not intended as a method of teaching specifics, but rather as a practical learning experience for the student. The course does not teach design or problem solving or cost analysis. Rather, the course is intended to provide the student with the importance of these and similar factors in the day-to-day practice of engineering. In particular, the student will find that effective technical communications within the team, between individual team members and individuals who are sources of needed technical information (experts, vendors, peers, etc.), and between the team and the instructor (acting as the engineering supervisor), are absolutely essential. These communications are primarily oral, but there will also be written communications in the form of weekly reports and the project final report.

**GRADING:** Each group will present reports as follows:

Mid-Term Oral Reports: All of the students (*e.g.*, 20 students divided equally into four groups) will be presenting, observing, and critiquing presentations for at least 100 minutes (*i.e.*, the equivalent time of two 50-minute lectures or "2 hours"). The format for the Mid-Term Oral Report will consist of each student in the group giving a 3 to 4 minute presentation describing their roles and accomplishments in the design and the outcome of their efforts in a "hardware realization". During the presentations, the other group members (*i.e.*, the student peers) will use the "green card" (Clemson University ETC Program Oral Presentation Message For ---) to provide feedback comments for each speaker. These presentations will also be critiqued by an ECE faculty member. This grade will be weighted as 10% of the final grade.

Final Oral Reports: Each individual will participate in the group's final oral presentation according to same procedure used for the Mid-Term Oral Report. This presentation will describe the design approach and report the performance of the designed system. A panel of three judges will also grade this presentation. This grade will be weighted as 10% of the final grade.

Final Written Report: Each group will collaborate on a comprehensive final written report describing their design approach and reporting the performance of the designed system. It is expected that this report will be based on the comprehensive design folders that each student has maintained during the semester. The grade on this report will be weighted as 20% of the final grade.

Technical Approach: Each group will receive a grade weighted at 20% based on the technical approach taken.

Total Competition Score: Each group's total competition score is based on the bonus day score and the final competition score (See Appendix D). Each group's total competition score is based on the performance their design in comparison to the other ECE 496 designs. The total competition score is weighted at 40% of the final grade.

Group Leader Grades: Group leaders will be graded separately by the instructor, based on the instructor's assessment of the performance of each during the semester. This will be based both on the group's performance and the instructor's assessment of how smoothly the group functioned under the group leader's guidance. In addition to this course grade, the group leaders are given a "bonus" of "A" for one hour of credit for ECE 492 regardless of their final ECE 496 grade. It will be necessary for group leaders who wish to receive this credit for one hour of ECE 492 to fill out the necessary forms to add this course and give them to the Undergraduate Program Secretary. NOTE: the instructor has the option of lowering the final course grade of any student who does not meet all of the requirements of the course.

**ATTENDANCE POLICY:** All ECE 496 students must attend the following lectures:

1. Orientation (see the course schedule booklet for the first day of class).
2. Communication within the Project Team (second weekly meeting of the class).
3. Communication with the "Outside World" (third weekly meeting of the class).
4. Dealing with Barriers to Communication (fourth weekly meeting of the class).

The instructor will meet with group leaders on a biweekly basis to discuss progress and problems. Times for these meetings will be arranged with the individual group leaders.

**GROUP COMMUNICATION WITH INSTRUCTOR:** Because of the few formal class meetings during the semester, communication between groups and the instructor will rely mainly on periodic reports to the instructor and notices placed on the ECE 496 web page. Any student with an urgent problem should make direct contact with the instructor via e-mail.

**REQUIRED REPORTS AND OTHER DOCUMENTATION:** The following reports and other documents are required as indicated:

1. Design Folder. All students are required to maintain a “design folder”. The folder must contain a complete record of the student’s personal activity in the design project: all rough work, reports, design calculations, decisions, etc. The design folder can be called for by the instructor with 24 hours notice and if not submitted will result in a letter grade reduction for the student concerned. Each student will be required to submit his or her folder at least once during the semester, on a random basis. The instructor will call for design folders by 12:00 noon via e-mail. (Have your group leader clarify where and when with the instructor). This folder must be handed in to the instructor by 12:00 noon the following day.

2. Weekly Report. Each group is required to submit a one-page weekly progress report, using the format shown in Appendix B. These reports are due by 4:00 pm each Friday. The group leader will assign authorship duties each week and assure that the report has been submitted on time. The instructor has the option of lowering the grade when the report is late. The report should be e-mailed to: **darren.dawson@ces.clemson.edu**

3. Midterm Oral Report. Midterm oral reports will be presented in accordance with the schedule shown in Appendix E. Each student will make a 3 to 4 minute presentation, as previously described in the section entitled GRADING. Each student will attend, observe, and provide feedback on the “green card” for at least three other group presentations.

4. Final Written Report. Reports must be presented in an electronic web-based format that exploit the multimedia features of today's technology. The link for the written report is due in the instructor’s office by the deadline time indicated in Appendix E. The web-based report will then be copied to the ECE server, and hence, this will be the version of the report that will be graded. The link for the report should be e-mailed to: **darren.dawson@ces.clemson.edu**. Examples of prior written project reports are on reserve at the Library. Please adhere to the following format while creating your webpages: i) Keep all html and image files in only ONE directory, ii) If you have links to any other pages in the same site, please type in the complete address, (i.e. if your webpage and the link is on hubcap; type `<a href="http://hubcap.clemson.edu/~username/filename.html">Link</a>`), iii) All external links will have the full address. You must follow this format since we will be downloading the project files onto our website. The final written reports will be graded according to the criteria given in the subsequent section of this syllabus entitled JUDGING CRITERIA.

5. Final Oral Report. Final oral reports for each group will be presented in accordance with the schedule shown in Appendix E. Each student will make a 3 to 4 minute presentation, as previously described in the section entitled GRADING. Each student will attend, observe, and provide feedback on the “green card” for at least three other group presentations.

**JUDGING CRITERIA:** The criteria listed subsequently in this section will be used by the judges in evaluating each group's performance.

### OVERALL TECHNICAL APPROACH

Originality, Technical Feasibility, Practical Implementation, System Considerations, System Simulation, Performance Score

### MIDTERM AND FINAL ORAL PRESENTATIONS

(See the form "The Competent Speaker Speech Evaluation Form" attached to this syllabus.)

### FINAL WRITTEN REPORT

Organization, Language (syntax, punctuation, etc.), Readability (style, typos, etc.), Use of Graphics (figures, tables), Technical Content

**PROJECT:** The project for this semester is described in Appendix A. You are encouraged to read the complete project description very carefully.

**WRITTEN AND ORAL REPORT PREPARATION:** The facilities of the Effective Technical Communications program are available and are recommended for the preparation of professional-looking visual aids and reports. See Appendix C.

## **APPENDIX A - INVERTED PENDULUM CONTEST RULES**

*OBJECTIVE:* Each group must design and build a system to balance the pendubot and make the pendubot perform a specific acrobatic maneuver (i.e., the pendubot starts at the stationary vertical down position and must swing up to the inverted position). The total time for which the task is performed plays a role in determining the final grade for the project.

### *Rules and Regulations*

1. A schematic drawing which details the pendubot specifications is given in a PDF file found on the ECE 496 Web Page.
2. The pendubot must behave as an inverted pendulum as determined by the course instructor and each of the pendubot links must be 18 inches in length.
3. A standard regulation golf ball must be mounted at the top of pendubot.
4. Check with the course instructors to see if any of your innovative concepts are acceptable as solutions to this problem.
5. Only sensors may be connected to the pendubot bars. That is, no motors can be used to move the top pendubot bar.
6. Once your pendubot is in the "starting position", it can receive no outside assistance.
7. No magnets can be used for levitation.
8. The team can not use a purchased motor control system.
9. The team can use a motor that already has a sensor mounted to it.
10. Only one actuator or motor can be used in the project.
11. The faculty makes all rules and determines whether a rule is satisfied or violated. If any rule is unclear, check with instructor.

## **APPENDIX B - WEEKLY REPORT FORMAT**

**ABSTRACT:** (The purpose of the abstract is to concisely state in 25 words exactly what has been achieved.)

**SUMMARY:** (The summary briefly describes your achievements and plans in more detail. The summary must not exceed 150 words.)

Authorized by: (Signature of Group Leader)

Prepared by: (Signature of Student)

Date:

## **APPENDIX C - ETC FACILITIES**

ETC Audio/Visual Room - Riggs 19: The ETC Audio/Visual Room provides rehearsal and video taping capability. This room has video taping and playback equipment, overhead projector and screen, twenty upholstered chairs and carpeted floors.

ETC Services - Riggs 10G: Free materials for transparencies and Xerox copies are provided. In addition, Reference Books on written and oral communication are available.

## **APPENDIX D - GRADING**

Competition (40%)  
Written Report (20%)  
Oral Report (20%)  
Technical Approach (20%)

Grades are averaged for B average in each section because different judges are used for each section.

## **BONUS DAY**

Bonus - To win bonus points, the group must demonstrate that the group has built a pendubot, which can balance in upright position when subjected to a disturbance. The total bonus points, which are 10 points, are awarded to a team that illustrates that they have built a functioning pendubot. Lower scores will be awarded for partial completion of the task. Your team will be allowed several attempts to demonstrate the performance of your inverted pendulum. (Maximum 10 points available)

## **COMPETITION SCORING**

- You will have ten minutes on competition day in which to perform the acrobatic maneuver. You may make as many attempts as possible in the ten minutes, and submit the best performance.
- The fastest time will receive 40 points with all other scores being normalized by the fastest score. For example, if the fastest time is 2 seconds, and Group Z accomplishes the task in 5 seconds then Group Z will receive  $(2/5)*40 = 16$  points.
- You will use the swing up the pendubot. I will let the clock run until I am certain that the golf ball is contained within the two edges of the fork. This is your STARTING RUN.
- To get your BEST RUN; once your pendubot swings up, I will stop the clock as soon as the golf ball passes the first edge. If it goes beyond the second edge, then it is an illegal run. Each group will have a maximum of 10 minutes.

## **Appendix E - Timetable**

**ORIENTATION:** (See the course schedule booklet for the first day of class)

**FIRST WEEKLY REPORT DUE:** - 1<sup>st</sup> Friday after the first Biweekly Meeting  
Then - EVERY FRIDAY BY 4:00 P.M via email (check the schedule on the 496 webpage).

**LECTURE COURSE:** (Every student must attend)

- Communication within the Project Team (This class is usually the second weekly meeting of the class in the scheduled class room; however, you should check the 496 webpage).
- Communication with the “Outside World” (This class is usually the third weekly meeting of the class in the scheduled class room; however, you should check the 496 webpage).
- Dealing with Barriers to Communication (This class is usually the fourth weekly meeting of the class in the scheduled class room; however, you should check the 496 webpage).

**BIWEEKLY MEETING WITH GROUP LEADERS:** Starts the fifth weekly class meeting (check the schedule on the 496 webpage).

**MIDTERM ORAL REPORT:** Three Weeks before Bonus Day (check the schedule on the 496 webpage). Every student must attend all of the presentations on the day of their group’s presentation.

**BONUS DAY:** On Friday - two weeks before COMPETITION DAY – 1:00 pm to 2:00 pm (check the schedule on the 496 webpage).

**COMPETITION DAY:** On Friday - Next to last Friday before the Monday on Finals Week – 1:00 pm to 2:00 pm (check the schedule on the 496 webpage).

**WRITTEN REPORTS:** On Monday 8:00am – Monday before the Monday on Finals Week (check the schedule on the 496 webpage).

**FINAL ORAL REPORT:** The Week before the Monday on Finals Week (check the schedule on the 496 webpage). Every student must attend all of the presentations on the day of their group’s presentation.