University of Massachusetts Amherst
Department of Electrical and Computer Engineering

SDP06

September 2005

ECE 415 - Senior Design Project I - Fall 2005 - 2 cr
ECE 416 - Senior Design Project II - Spring 2006 - 2 cr

Description:

ECE 415 - With Lab. Principles of engineering design process. Small groups of students design computer/electronic systems to specifications. Preliminary paper design followed by hardware or software prototype. Students must complete project in ECE 416. Prerequisites: ECE 323, ECE 313, ECE 222 or 353. For EE and CSE majors only.

ECE 416 - Continuation of ECE 415. Design of small computer/electronic system built, refined, tested, and demonstrated. Final prototype shown to meet initial specifications. Final design review. Prerequisite: ECE 415.

Objectives:

After successfully completing this course, a student should be able to:

1. Apply engineering design principles to formulate problem statement, analyze requirements and produce a system-level block diagram.
2. Prototype an electronic and/or software system to meet given specifications.
3. Integrate knowledge from across the core CSE or EE curriculum.
4. Take a systems approach to problem solving.
5. Work productively in a team environment.
6. Effectively communicate technical ideas and concepts.

SDP Coordinators:

C. V. Hollot, Professor and Associate Department Head
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T. Baird Soules, Lecturer and Undergraduate Program Director
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SDP Technician:

Francis Caron, 9A Marcus Hall, fkcaron@ecs.umass.edu,
Hours: 8:00 A.M. – 4:00 P.M., Mon - Fri

Project Management:

In order to facilitate team organization and communication, each team will have one member who is designated as the project manager. This position can be permanent or rotate amongst the team members. The project manager is decided by the team and advisor and communicated to the SDP course coordinators during the third week of September.

Responsibilities of the project manager include:

- function as liaison between the team and the advisor
- insuring that deadlines are met
- insuring that the team is prepared for the weekly advisor meetings
- responsible for assembling weekly team report
- responsible for logistics and confirmations associated with weekly team meetings, weekly advisor meetings, the PDR, MDR, PDR II, CDR, Advisor's Demo Week and Demo Day. This includes room and presentation equipment reservations.

It should be noted that other team members will have areas of responsibility defined as the project moves forward. The role of project manager is clearly defined early in the process due to the general logistical nature of the role. The project manager offers general support of the design effort while the other roles will be tailored to project-specific needs.

Notebook:

Engineering laboratory notebooks are legal documents that can be used in court to prove ownership of a design. You are to keep notes in a bound or spiral notebook (one for each team member). Before using the notebook, number all the pages. This book is to be taken with you to your meetings with your advisor. It will be used to monitor your progress and demonstrate to your advisor the ownership of your design

Weekly Team Meetings:

Weekly team meetings are for the team members to meet with each other. This can be either before or after the weekly advisor meetings, but meeting the day before the advisor meeting is encouraged in order to be prepared to make best use of the time with the advisor. It is the project manager's responsibility to set up these meetings.

Weekly Advisor Meetings:

Each project team will have a weekly team meeting with their project advisor. The purpose of each meeting is to have each team member report on progress that has been made, barriers that have been identified and clarification of short- and long-term goals. It is the project manager's responsibility to set up these meetings with the project advisor.

Required Text:

J. E. Salt and R. Rothery, *Design for Electrical and Computer Engineers*, Wiley, 2002, ISBN 0-471-39146-8

All-Course Meetings: Th 4:00-5:15, GOES 20 (Fall 2004).

Course Deliverables:

Besides the weekly team meetings and advisor meetings, the schedule includes all-course meetings and deliverables:

- Needs Assessment and Problem Statement
- Requirement Specifications
- System Block Diagram
- Preliminary Design Review (PDR) and report
- Mid-Term Design Review (MDR) and report
- Preliminary Design Review II
- Comprehensive Design Review (CDR)
- Advisors Demo and draft final report
- Public Demo
- Team Project CD

A calendar for these deliverables is given in the attached "Schedule at a glance." These deliverables are now described:

Statement of the Problem Assignment

You are asked to prepare a statement of the problem for the project you have chosen. It is to be a team effort You are encouraged to work closely with your advisor on this assignment, but remember that you, not your advisor, are responsible for it. Your team's problem statement is to be posted on your team's website.

Requirements Specification Assignment

You are asked to prepare a requirements specification for the project you have chosen. It is to be a team effort You are encouraged to work closely with your advisor on this assignment, but remember that you, not your advisor, are responsible for it. Your team's requirement specification is to be posted on your team's website.

System Block Diagram Assignment

The team is to prepare a block diagram of a system that will meet the specifications in the requirements specification. A general description of how the system works and a plan for the system analysis must accompany the block diagram. (Note: Only a *plan* for how the system will be analyzed is required.) The analysis plan will point out things like:

1. The system will be modeled mathematically and analyzed using transform theory.
2. The system is very non-linear and cannot be linearized over the region of operation therefore the system must be analyzed through computer simulation.
3. The key to the system lies in the performance of a particular block and it is essential that this block be built (crudely) and its performance measured as part of the system analysis.

The analysis plan should also contain estimates of how long it will take to complete the analysis. It is to be a team effort You are encouraged to work closely with your advisor on this assignment, but remember that you, not your advisor, are responsible for it. Your team's requirement specification is to be posted on your team's website.

Preliminary Design Review (PDR)

The twofold purpose of the PDR is for the team to present their preliminary design and receive feedback from the Faculty Review Board on that design. At the PDR, each team will deliver a written report presentation to the Faculty Review Board and team advisor. Each team member will participate in the preparation of the report as well as the preparation and delivery of the Powerpoint presentation. The report and presentation will include problem statement, requirement specifications, system-level block diagram and project specifications, as well as the team's proposed MDR prototype specifications. The advisor and Faculty Review Board will modify the proposed MDR prototype specifications at the PDR. The MDR prototype specifications should be substantial and complete enough to demonstrate that the team has successfully tackled one or more of the core technical design challenges of the overall project. The MDR prototype specifications will be included in the team presentation to the class at an all-course meeting. The MDR prototype specifications will be sent to the SDP course coordinators by the project manager.

The PDR will be held in the SDP lab and it is the project manager's responsibility to schedule their team's PDR.

Mid-Course Design Review (MDR)

The Mid-course Design Review (MDR) will take place before the Faculty Review Board and the team advisor near the end of fall semester (see schedule at a glance). The twofold purpose of the MDR is for the team to present a prototype (and it's associated design) and to receive feedback from the Faculty Review Board and the team advisor on that design. The hardware and/or software prototype presented should demonstrate that the chosen design path is likely to lead to a completed project in April which meets or exceeds the project specifications.

The role of the Faculty Review Board is to provide independent feedback to the advisors and team members. The review board will consist of ECE faculty members and will participate in all MDRs.

Each team will turn in a written report and deliver a Powerpoint presentation at the MDR. Each team member will participate in the preparation of the report as well as the preparation and delivery of the Powerpoint presentation. The MDR report and presentation will include problem statement, requirement specifications, system-level block diagram, project specifications, and an explanation and demonstration of how the MDR specifications were met this semester. Board suggests grade to advisor

The MDR will be held off Engineering quad, and it is the project manager's responsibility to schedule the specific MDR time for their team.

Comprehensive Design Review (CDR):

Presented to Faculty Review Board and Project Advisor, usually at the team's bench in the SDP Lab. Includes poster. The CDR presentation focuses on a working demonstration of how the prototyped software/hardware meet the project specifications. Board suggests grade to advisor.

Grading:

Team members will be graded individually by their SDP project advisors. After the Mid-course Design Review, the Design Review Board will recommend semester grades for each team member based on the report and oral presentation. The project advisors will take this feedback into account when assigning the semester grade.

The team members may receive different letter grades. Your performance on your portion of the project, contributions towards progress reports and your participation level in the weekly meetings will impact your final grade. The importance of each member's preparedness and participation in the weekly meetings is crucial to the success of the projects.

Academic Dishonesty:

Any form of academic dishonesty (see definition in the Undergraduate Rights and Responsibilities booklet) will not be tolerated. Academic dishonesty will lead to a failure in the assignment in question, failure in the course, and/or further disciplinary action at the university level. Cases of academic dishonesty will be reported to the Department Head, the Asst. Dean and the University Academic Honesty Board.

Relationship to Program Outcomes:

The ECE undergraduate program as a whole has ten educational program outcomes. This course contributes towards meeting those outcomes. The table below shows how the five course objectives above relate to the program outcomes.

PROGRAM OUTCOMES						
	1	2	3	4	5	6
1. Well grounded in the fundamental concepts of math, physics, chemistry, computer science, and engineering science	N	Y	Y	Y	N	N
2. Able to identify, formulate and solve problems in ECE	Y	Y	Y	Y	N	N
3. Able to design and conduct experiments, and to analyze and interpret measured data	Y	Y	Y	Y	N	N
4. Capable of designing analog and digital systems, components, and processes to meet desired needs	N	Y	Y	Y	N	N
5. Proficient in using modern engineering techniques and computing tools for effective engineering practice	Y	Y	Y	Y	N	N
6. Experienced in engineering teamwork, and in solving technically diverse and multidisciplinary problems	Y	Y	Y	Y	Y	Y
7. Able to communicate effectively orally and in writing, and through symbolic and graphical expression	Y	Y	N	Y	N	Y
8. Aware of professional and ethical responsibilities as engineers	N	Y	N	N	Y	Y
9. Aware of the impact of ECE technology and decisions on society	Y	Y	Y	Y	N	N
10. Motivated about the importance of lifelong learning, scholarship and professional development	N	N	N	N	N	N

Prepared by: T. Baird Soules and C. V. Hollot Date: September 2005