Proposal Form For Addition And Revision Of Courses

1. Proposing College / School: Samuel Ginn College of Engineering
   Department: Electrical and Computer Engineering

2. Course Prefix and Number: ELEC 3040

3. Effective Term: Spring 2010

4. Course Title:
   Electrical System Design Lab
   Abbreviated Title (30 characters or less):
   Electrical System Design Lab

5. Requested Action:
   - Add a Course
   - Re-number a Course
   - Revise a Course
   Current Course Number:
   Proposed Course Number:
   Type of Revision:

6. Course Credit:
   Maximum Hours
   (Repeatability):
   Contact/Group Hours
   Scheduled Type (e.g.: Lab, Lecture, Practicum, Directed Study)
   Weekly or Per Term?
   Credit Hours
   Anticipated Enrollment

   Maximum Hours
   (Repeatability):
   1
   3
   Lab
   Weekly
   1
   12
   Total Credit Hours: 1

7. Grading Type:
   - Regular (ABCDF)
   - Satisfactory/Unsatisfactory (S/U)
   - Audit

8. Prerequisites/Corequisites:
   Use “P:” to indicate a prerequisite, “C:” to indicate a corequisite, and “P/C:” to indicate a prerequisite with concurrency.
   P - ELEC 3030, ELEC 2220
   P/C - ELEC 3500

9. Restrictions: List specific restriction in space above.
   - College
   - Major
   - Standing
   - Degree

10. Course Description:
    (20 Words or Less; exactly as it should appear in the Bulletin)
    Exploration and integration of electrical engineering concepts and professional practice issues through the design of a contemporary engineering system.

11. May Count Either
    Program Type
    (e.g.: minor, major, etc.)
    Program Title
    (e.g.: MS in Chemistry, Performance Option, Minor in Art)
    Requirement or Elective?
    (required or optional?)

12. Affected Program(s):
    Major
    ELEC (Bachelor of Electrical Eng.)
    Required

13. Overlapping or Duplication of Other Units’ Offerings:
    (If course is included in any other degree program, is used as an elective frequently by other unit(s), or is in an area similar to that covered by another college/school, attach correspondence with relevant unit)
    - Applicable
    - Not Applicable
14. Justification:
Course title is being changed from "EE Lab IV" to "Electrical Systems Design Lab" due to elimination of EE Labs I and II (ELEC 2010-2020). New title also more accurately reflects content.

(Include a concise, yet adequate rationale for the addition/revision of the course, citing accreditation, assessments (faculty, graduate, and/or external) where applicable)

15. Resources:
None

(Indicate whether existing resources such as library materials, classroom/laboratory space, and faculty appointments are adequate to support the proposed addition/revision; if additional resources are required, indicate how such needs will be met, referencing the appropriate level of authorization -- i.e.: Dean -- where necessary; if no additional resources or shifting of resources will be necessary, respond "Not Applicable")

16. Student Learning Outcomes:
1. Develop ability to apply multidisciplinary EE concepts and technologies using control system problems;
2. Develop proficiency in written and oral technical communication;
3. Develop ability to apply engineering design principles;
4. Develop cross-functional skills, including teaming and ethical decision making.

(State in measurable terms (reflective of course level) what students should be able to do when they have completed this course)

17. Course Content Outline:
Week 1. Software development and debugging with CodeWarrior for the MC8SC128 "DragonFly" module; engineering documentation.
Week 2. C program design and debug
Week 3. Parallel inputs/outputs, test instruments (oscilloscope, logic analyzer)
Week 4. Parallel I/O exercise – keypad interface – hardware/software
Week 5. Interrupt support hardware and software for keypad control.
Week 6. Real-time operation with programmable interval timer and interrupts.
Week 7. PWM waveform generation with the programmable interval timer or PWM generator.
Week 8. BJT switch to drive DC motor
Week 10. Motor speed sensing: tachometer amplitude measurement.
Week 12. Controller design (requirements, model & implement).
Week 14. Effective communication. Continue work on feedback controller.
Week 15. Submit ethics case study, course evaluation. Final Project presentations and demos.

(Provide a comprehensive, week-by-week breakdown of course content, including assignment due dates)

18. Assignments / Projects:
Weekly laboratory projects, including the final design project are listed above. All design projects are done in 2-member teams.

Team memos are submitted biweekly, with team members alternating writing the memo for the team.
Each student keeps, and submits biweekly, an engineering notebook.
Each student writes a paper on an engineering ethics case study.
Each student writes a final report.
Each team makes a final oral presentation and project demonstration.

(List all quizzes, projects, reports, activities and other components of the course grade -- including a brief description of each assignment that clarifies its contribution to the course’s learning objectives)

19. Rubric and Grading Scale:
Project success/final demonstration 20%
Project communication skills:
  Bi-weekly reports 10%
  Engineering ethics paper 5%
  Final written report 15%
  Final oral presentation 10%
<table>
<thead>
<tr>
<th>Weekly design and conduct of experiments:</th>
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<tbody>
<tr>
<td>Lab notebooks  10%</td>
</tr>
<tr>
<td>Lab performance (GTA assigned) 10%</td>
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<tr>
<td>Lab performance (from status reports)  5%</td>
</tr>
<tr>
<td>Teamwork  10%</td>
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<tr>
<td>Professionalism  5%</td>
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</table>

List all components of the course grade -- including attendance and/or participation if relevant -- with point totals for each; indicate point totals and ranges or percentages for grading scale; for S/U grading, detail performance expectations for a passing grade.

20. Justification for Graduate Credit: N/A

(Include a brief statement explaining how the course meets graduate educational standards (i.e.: rigorous standards for evaluation, development of critical thinking and analytical skills, etc.))

(Include below are standard statements regarding course policies. If necessary, a statement may be altered to reflect the academic policies of individual faculty members and/or the academic unit or department, provided that there is no conflict with the Tiger Cub, Faculty Handbook, or any existing university policy.)

POLICY STATEMENTS

Attendance: Although attendance is not required, students are expected to attend all classes, and will be held responsible for any content covered in the event of an absence.

Excused Absences: Students are granted excused absences from class for the following reasons: illness of the student or serious illness of a member of the student’s immediate family, the death of a member of the student’s immediate family, trips for student organizations sponsored by an academic unit, trips for university classes, trips for participation in intercollegiate athletic events, subpoena for a court appearance, and religious holidays. Students who wish to have an excused absence from class for any other reason must contact the instructor in advance of the absence to request permission. The instructor will weigh the merits of the request, and render a decision. When feasible, the student must notify the instructor prior to the occurrence of any excused absences, but in no case shall such notification occur more than one week after the absence. Appropriate documentation for all excused absences is required. Please see the Tiger Cub for more information on excused absences.

Make-Up Policy: Arrangement to make up a missed major examination (e.g.: hour exams, mid-term exams) due to properly authorized excused absences must be initiated by the student within one week of the end of the period of the excused absence(s). Except in unusual circumstances, such as the continued absence of the student or the advent of university holidays, a make-up exam will take place within two weeks of the date that the student initiates arrangements for it. Except in extraordinary circumstances, no make-up exams will be arranged during the last three days before the final exam period begins.

Academic Honesty Policy: All portions of the Auburn University student academic honesty code (Title XII) found in the Tiger Cub will apply to university courses. All academic honesty violations or alleged violations of the SGA Code of Laws will be reported to the Office of the Provost, which will then refer the case to the Academic Honesty Committee.

Disability Accommodations: Students who need special accommodations in class, as provided for by the Americans With Disabilities Act, should arrange for a confidential meeting with the instructor during office hours in the first week of classes (or as soon as possible if accommodations are needed immediately). The student must bring a copy of their Accommodation Letter and an Instructor Verification Form to the meeting. If the student does not have these forms, they should make an appointment with the Program for Students with Disabilities, 1286 Haley Center, 844-2096 (V/TT).
ELEC 3040 – ELECTRICAL ENGINEERING LAB IV


Student laboratory manual.

References: EE Laboratory Teacher’s Manual


Coordinator: J. Y. Hung, Associate Professor of Electrical Engineering

Goals: Exploration and integrated study of multidisciplinary EE concepts and technologies using control system problems; Practice in written and oral technical communication; Development of engineering design experience; Exposure to cross-functional issues including teaming and ethical decision making.

Prerequisites by topic:

1. Linear systems
2. Logic and computer systems
3. Electronics
4. Computer programming
5. Feedback systems (co-requisite)

Topics:

1. Linear systems, electronics, digital systems, power electronics, computer programming, feedback systems. Other topics include: practice of oral and written communication, team-based design, and decision-making ethics. See the attached sample course syllabus.

Typical method for evaluating student performance:

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Laboratory practice</td>
<td>25%</td>
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<tr>
<td>Written reports</td>
<td>50%</td>
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<tr>
<td>Oral communications</td>
<td>25%</td>
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</tbody>
</table>

Computer usage:

Students use computer tools on a regular basis to analyze models, develop solutions, and author reports and presentations. MATLAB, C, or assembly language programming are used.

Laboratory projects (including major items of equipment and instrumentation used):

Varying according to the weekly topic (see the attached sample course syllabus). This is a laboratory-based course.
(15 weeks). Student projects require the use of breadboards, power supplies, signal generators, oscilloscopes.

Class attendance: Class attendance and its effect on course grade is the prerogative of the individual instructor and will be part of the course outline and announced the first day of class.

Policy on unannounced quizzes: Unannounced quizzes and their effect on course grade are the prerogative of the individual instructor and will be part of the course outline and announced the first day of class.

ABET category content as estimated by faculty member who prepared this course description:

- Engineering science: 0.2 credit or 20 %
- Engineering design: 0.8 credit or 80 %

Students who need special accommodations should make an appointment to discuss their needs as soon as possible.

Prepared by: John Y. Hung Date: October 1, 2000
Teams of 2-3 students work on two projects over the entire semester.
- Project 1: An autonomous mobile robot, using continuous-time (analog electronics) control. All work, including final reporting is performed over an 8-week period. Project 1 concepts are the groundwork for Project 2.
- Project 2: A digital control system for an electric motor. Students study applicable issues starting from week 1.
- Bold-face indicates activity related to “non-technical” issues: communication, ethics, teaming, etc.

## Course Outline and Topics

<table>
<thead>
<tr>
<th>Wk</th>
<th>Lecture (1 hour/week)</th>
<th>Laboratory (2 hours/week) and homework</th>
</tr>
</thead>
</table>
| 1  | * principles of engineering documentation  
• system modeling | * modeling and computer simulation using MATLAB  
• mobile robot base constructed by end of the week |
| 2  | * electronic sensors  
• processes of effective teams | * design and test a position sensor, e.g. opto-electronic sensor |
| 3  | * sensor signal conditioning (signal processing)  
• effective presentations | * study optical encoder on motor  
• design instrumentation to condition analog encoder signal, convert to TTL logic level pulses |
| 4  | * switching amplifiers | * study an analog PWM controller integrated circuit, e.g. LM3524 analog PWM controller IC |
| 5  | * feedback system principles  
• Team written proposal due for robot design | * Team Member A: oral design proposal (robot) |
| 6  | * computer interfaces | * develop PWM software for digital controller |
| 7  | * computer interfaces  
• teaming checklist | * implement transistor H-bridge subsystem  
• test H-bridge subsystem with PWM software |
| 8  | * electromechanical energy conversion | * develop computer interface for optical encoder, based on LM2907 voltage/frequency converter |
| 9  | * PID compensation | * finish integrating digital control system hardware: sensor interface, computer, H-bridge |
| 10 | * Parameter identification | * Team Member B: oral design proposal (motor) |
| 11 | * Digital controller implementation | * Use control system hardware to characterize the system dynamics (e.g. step response) |
| 12 | * The Ethics Challenge | * work on motor control and robot projects |
| 13 | DSP guest lecture? | * work on motor control and robot projects |
| 14 | * Emag guest lecture? | * Oral presentations by entire Team (motor)  
• Team: written final report (robot)  
• Team Engineering Notebooks due |

### Communication development

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<thead>
<tr>
<th></th>
<th>Oral</th>
<th>Written</th>
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<tbody>
<tr>
<td>Student A</td>
<td>robot design proposal</td>
<td></td>
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<tr>
<td>Student B</td>
<td>motor controller design proposal</td>
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<tr>
<td>team</td>
<td>robot design proposal</td>
<td></td>
</tr>
<tr>
<td>team</td>
<td>description of motor controller</td>
<td></td>
</tr>
<tr>
<td>team</td>
<td>robot design final report</td>
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<tr>
<td>team</td>
<td>engineering notebook for motor controller</td>
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</tbody>
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ELEC 3040 – ELECTRICAL SYSTEM DESIGN LAB
(Required for ELEC)

2010 Catalog Data: ELEC 3040. ELECTRICAL SYSTEM DESIGN LAB (1) LAB. 3. Pr., ELEC 3030, ELEC 2220. Coreq., ELEC 3500. Exploration and integration of electrical engineering concepts and professional practice issues through the design of a contemporary engineering system.

Textbook: ELEC 3040 Laboratory Manual:
On-line at http://www.eng.auburn.edu/~nelsovp/courses/elec3040


Coordinator: J. Y. Hung, Professor of Electrical Engineering

Goals:
1. Develop ability to apply multidisciplinary EE concepts and technologies using control system problems;
2. Develop proficiency in written and oral technical communication;
3. Develop ability to apply engineering design principles;
4. Develop cross-functional skills, including teaming and ethical decision making.

Prerequisites by topic:

1. Logic and computer systems
2. Electronics
3. Computer programming
4. Feedback systems (co-requisite)

Topics (one laboratory period each):

1. Software development and debugging with CodeWarrior for the MC9SC128 “DragonFly” module; engineering documentation.
2. C program design and debug
3. Parallel inputs/outputs, test instruments (oscilloscope, logic analyzer)
4. Parallel I/O exercise – keypad interface – hardware/software
5. Interrupt support hardware and software for keypad control.
6. Real-time operation with programmable interval timer and interrupts.
7. PWM waveform generation with the programmable interval timer or PWM generator.
8. BJT switch to drive DC motor
10. Motor speed sensing: tachometer amplitude measurement.
12. Controller design (requirements, model & implement).
14. Effective communication. Continue work on feedback controller.
15. Submit ethics case study, course evaluation. Final Project presentations and demos.
Typical method for evaluating student performance:

- Project success/final demonstration 20%
- Project communication skills:
  - Bi-weekly reports 10%
  - Engineering ethics paper 5%
  - Final written report 15%
  - Final oral presentation 10%
- Weekly design and conduct of experiments:
  - Lab notebooks 10%
  - Lab performance (GTA assigned) 10%
  - Lab performance (from status reports) 5%
  - Teamwork 10%
- Professionalism 5%

Computer usage:

Students use computer tools on a regular basis to analyze models, develop solutions, and author reports and presentations. MATLAB, C, or assembly language programming are used.

Laboratory projects (including major items of equipment and instrumentation used):

Varying according to the weekly topic (see above). This is a laboratory-based course (15 weeks). Student projects require the use of breadboards, power supplies, signal generators, oscilloscopes.

Class attendance: Class attendance and its effect on course grade is the prerogative of the individual instructor and will be part of the course outline and announced the first day of class.

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ABET category content as estimated by faculty member who prepared this course description:

- Engineering science: 0.2 credit or 20%
- Engineering design: 0.8 credit or 80%

Special Accommodations:

Students who need accommodations are asked to arrange a meeting during office hours the first week of classes, or as soon as possible if accommodations are needed immediately. If you have a conflict with my office hours, an alternate time can be arranged. To set up this meeting, please contact me by E-mail. Bring a copy of your Accommodation Memo and an Instructor Verification Form to the meeting. If you do not have an Accommodation Memo but need accommodations, make an appointment with The Program for Students with Disabilities, 1244 Haley Center, 844-2096 (V/TT).

Academic Honesty Policy:

All portions of the Auburn University student academic honesty code (Title XII) found in the Tiger Cub will apply to this class. All academic honesty violations or alleged violations of the SGA Code of Laws will be reported to the Office of the Provost, which will then refer the case to the Academic Honesty Committee.
Primary program outcomes related to this course:

Outcome 1. Ability to apply knowledge of math, science and engineering to solve problems.
Outcome 2. Ability to apply in-depth knowledge in one or more disciplines
Outcome 3. Ability to design an electrical component or system to meet desired needs.
Outcome 5. Ability to design and conduct experiments to acquire needed data, and to analyze and interpret
data to solve engineering problems.
Outcome 6. Proficiency in the use of computers and other modern tools to solve engineering problems.
Outcome 7. Ability to function as a member of a multidisciplinary team in the solution of engineering
problems.
Outcome 8. Proficiency in communicating ideas orally and in writing.
Outcome 9: Appreciation of the need for, and an ability to learn new concepts as required for the continuing
practice of electrical engineering.
Outcome 10. Understanding of ethical responsibility and professional integrity issues related to the practice
of computer engineering.

Prepared by: John Y. Hung Date: September 15, 2009