# 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 3050  
   **Effective Term:** Spring 2010

4. **Course Title:** Embedded System Design Lab  
   **Abbreviated Title:** Embedded System Design Lab

5. **Requested Action:**  
   - Renumber a Course  
   - Add a Course  
   - Revise a Course  
   **Current Course Number:**  
   **Proposed Course Number:**  
   **Type of Revision:** Title, Prerequisite

6. **Course Credit:**  
   **Contact/Group Hours:** 3  
   **Scheduled Type:** Lab  
   **Weekly or Per Term?** Weekly  
   **Credit Hours:** 1  
   **Anticipated Enrollment:** 12  
   **Maximum Hours (Repeatability):** 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 2210  
   - P - ELEC 2220

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)  
    Development and integration of microcontroller-based hardware and software to design an embedded system to meet specified requirements. Issues related to professional practice.

11. **May Count Either**  
    **Program Type**  
    **Program Title**  
    **Requirement or Elective?**
    (Indicate if this particular course cannot be counted for credit in addition to another)

12. **Affected Program(s):**  
    (Respond "N/A" if not included in any program; attach memorandum if more space is required)  
    **Program Type**  
    **Program Title**  
    **Requirement or Elective?**
    (required or optional?)

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: ELEC 2020 is replaced by ELEC 2210 as a prerequisite, since ELEC 2020 and ELEC 2210 were merged in 2009.

The revised course title and description more accurately reflect the focus of this lab course, which is embedded system design, an important aspect of modern computer engineering practice.

(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. To be able to interface input/output devices to a computer system.
2. To be able to integrate hardware and software in designing a computer-based system.
3. To be able to present project results in written and oral technical reports.
4. To be able to function as a member of an engineering project team.
5. To gain an awareness of ethical issues and decision-making in engineering.

(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:

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Software development and debugging with CodeWarrior for the MCS5128 &quot;DragonFly&quot; module; engineering documentation.</th>
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<tbody>
<tr>
<td>Week 2</td>
<td>C program design and debug</td>
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<tr>
<td>Week 3</td>
<td>Parallel inputs/outputs, test instruments (oscilloscope, logic analyzer)</td>
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<tr>
<td>Week 4</td>
<td>Parallel I/O exercise – keypad interface – hardware/software</td>
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<td>Week 5</td>
<td>Interrupt support hardware and software for keypad control.</td>
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<td>Week 6</td>
<td>Real-time operation with programmable interval timer and interrupts.</td>
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<td>Week 7</td>
<td>PWM waveform generation with the programmable interval timer or PWM generator.</td>
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<tr>
<td>Week 8</td>
<td>BJT switch to drive DC motor</td>
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<tr>
<td>Week 9</td>
<td>Motor speed sensing: tachometer frequency counting.</td>
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<tr>
<td>Week 10</td>
<td>Motor speed sensing: tachometer amplitude measurement.</td>
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<tr>
<td>Week 11</td>
<td>Motor characterization (step response).</td>
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<tr>
<td>Week 12</td>
<td>Controller design (requirements, model &amp; implement).</td>
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<tr>
<td>Week 13</td>
<td>Engineering ethics. Continue work on feedback controller.</td>
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<tr>
<td>Week 14</td>
<td>Effective communication. Continue work on feedback controller.</td>
</tr>
<tr>
<td>Week 15</td>
<td>Submit ethics case study, course evaluation. Final Project presentations and demos.</td>
</tr>
</tbody>
</table>

(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%
Weekly design and conduct of experiments:
  Lab notebooks 10%
  Lab performance (GTA assigned) 10%
  Lab performance (from status reports) 5%
Teamwork 10%
Professionalism 5%

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.))

(Included 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, 1208 Haley Center, 844-2096 (V/TT).
ELEC 3050 – COMPUTER SYSTEM DESIGN LAB  
(Required for ECPE)

2004 Catalog Data:  ELEC 3050.  COMPUTER SYSTEM DESIGN LAB (1) LAB. 3.  Pr., ELEC 2020, ELEC 2220.  Laboratory experiments include interfacing memory and peripheral devices to a microcomputer, the design of software to control these devices, and the integration of computer hardware and software to control a system.


Coordinator:  Victor P. Nelson, Professor of Electrical and Computer Engineering

Course Objectives:
1. To be able to interface input/output devices to a computer system.
2. To be able to integrate hardware and software in designing a computer-based system.
3. To be able to present project results in written and oral technical reports.
4. To be able to function as a member of an engineering project team.
5. To gain an awareness of ethical issues and decision-making in engineering.

Prerequisites by topic:
1. Digital electronic circuit design
2. Computer organization
3. Computer programming (Assembly Language and C)

Topics (one laboratory period each):
1. Software development on the Microtrainer; engineering documentation.
2. Computer bus timing and analysis with oscilloscope and logic analyzer.
3. Parallel input/output port design.
5. Interrupt-driven parallel printer interface.
6. Stop-watch design with a programmable timer and interrupts.
7. PWM waveform generation with programmable timers and interrupts.
10. Analog-to-digital converter subsystem.
11. Experimentally determining the transfer function of a D.C. motor
12. Optimal speed control of a D.C. motor with a PID controller (project runs three weeks)
13. Effective presentations.
15. Team project oral presentations.
Typical method for evaluating student performance:

- Laboratory practice 25%
- Engineering notebook 20%
- Written reports 35%
- Oral communications 20%

Computer usage:
- Students design and implement computer hardware and software, using a personal computer for software development and debugging.
- Students use computer tools to author reports and presentations.

Laboratory Equipment and Instrumentation Used:
- “Microtrainer” computer interfacing station, personal computer for software development and debugging, oscilloscope, logic analyzer, DC motor, power supplies.

Class attendance: Class attendance is encouraged, but will not be accounted for in the course grade.

Policy on unannounced quizzes: There will be no unannounced quizzes.

Special Accommodations: Any student requiring special accommodations should come by my office within the first two days of class, bringing your letter from the Office of Students with Disabilities.

Contribution of course to meeting the professional component:
  - Engineering topics: 1 credit
  - Engineering design content: 100% (1 credit)

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 6. Proficiency in the use of computers and other modern tools to solve engineering problems.

Prepared by: Victor P. Nelson Date: February 25, 2004
ELEC 3050 – EMBEDDED SYSTEM DESIGN LAB
(Required for ECPE)

2010 Catalog Data: ELEC 3050. EMBEDDED SYSTEM DESIGN LAB (1) LAB. 3. Pr., ELEC 2210, ELEC 2220. Development and integration of microcontroller-based hardware and software to design a system to meet specified requirements. Issues related to professional practice.

Textbook: ELEC 3050 Laboratory Manual:
On-line at http://www.eng.auburn.edu/~nelsovp/courses/elec3050


Coordinator: Victor P. Nelson, Professor of Electrical and Computer Engineering

Course Objectives:
1. To be able to interface input/output devices to a computer system.
2. To be able to integrate hardware and software in designing a computer-based system.
3. To be able to present project results in written and oral technical reports.
4. To be able to function as a member of an engineering project team.
5. To gain an awareness of ethical issues and decision-making in engineering.

Prerequisites by topic:
1. Digital electronic circuit design
2. Computer organization
3. Computer programming (Assembly Language and C)

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 design and implement embedded microcontroller hardware and software, using the Freescale CodeWarrior integrated development environment (IDE) for software development and debugging.
- Students use computer tools to author reports and presentations.

Laboratory Equipment and Instrumentation Used:
- Microcontroller interfacing station, personal computer for software development and debugging, oscilloscope, logic analyzer, DC motor, power supplies.

Class attendance: Class attendance is encouraged, but will not be accounted for in the course grade.

Policy on unannounced quizzes: There will be no unannounced quizzes.

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.

Contribution of course to meeting the professional component:
- Engineering design: 100% (1 credit)

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: Victor P. Nelson Date: September 15, 2009