Course Syllabus

ELCT 302 – Control System Lab. Real time Systems Laboratory

Course Coordinator: Undergraduate Program Committee

Catalog Description: Laboratory course.

Credit Hours 3

Prerequisite(s) by course ELCT301, ELCT331 (or Co-req)

Prerequisite by topics Control & Circuit Theory

Required Textbook Fast and Effective Embedded Systems Design: Applying the ARM mbed, Rob Toulson and Tim Wilmshurst, Newnes, 2012

Course Outcomes:
Students who are successful in this class (i.e. earn a C or better) will demonstrate at least the abilities to:

• design and build optical and electromagnetic sensing and measurement circuits
• model the permanent magnetic DC motor and derive the transfer function
• design and analyze PID controller using a transfer function approach
• program microcontroller to accomplish control and data acquisition tasks
• use Matlab/Simulink to assist microcontroller programming
• execute functional decomposition of a system, design the subsystems, and build the integrated multidisciplinary system including software and hardware components.
• analyze data and write technical reports to summarize findings and results.
• teaming skill (define the outcome)

Students who demonstrate higher proficiency will earn higher grades.

Course Topics:

• Open Loop Microcontroller-based DC Motor Control
• Speed Measurement for a DC Motor Drive
• Model Identification for a DC Motor Drive
• Closed loop Simulation for a DC Motor Drive
• Closed-Loop Control for a DC Motor Drive
• Steering and Logic Control for an Autonomous Vehicle
• teaming skill (define what this is)

Course Contribution to Program Outcomes:
ELCT 302 contributes to an achievement of:

• Outcome A – an ability to apply knowledge of mathematics, science and engineering. The laboratory course requires students to apply their knowledge on circuits, control, modeling, physics, etc. in different laboratory practices to build a fully functional vehicle.
• Outcome B – an ability to design and conduct experiments, as well as to analyze and interpret data. Each laboratory in this course includes a complete process from design, implementation, data acquisition, result analysis, documentation and report. This process reflects the contents in Outcome B.

• Outcome C – an ability to design a system, component, or process to meet desired needs. The final goal of the laboratory course is to design a fully functional vehicles, it covers the system design, component selection, and system integration from the beginning to the very end.

• Outcome G – an ability to communicate effectively. This course is based on group team work. The students (with the similar background in EE) are worked as a team to fulfil their course goal.

• Outcome K – an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. In the course, the students will learn circuit design, Matlab/Simulink, microcontroller hardware/software and practice on oscilloscope, modeling, etc.

**General Course Policies**

**The EE Department** will make every attempt to obtain necessary components for each team's designs. Generic electronic components will be made available. However, these items will not be replaced in the event of damage. **Each team will be responsible for replacing damaged, destroyed or lost items.** Small parts such as transistors, op-amps, logic gates, etc. are expected to be discarded when damaged. It is expected that some of these types of components will be damaged during the design cycle. The Department will attempt to provide these components as needed but there is not an infinite supply nor is easy access a substitute for good engineering practice.

**Academic Integrity**

Students are expected to follow the University of South Carolina Honor Code and they should expect that every instance of a suspected violation will be reported. Students found responsible for violations of the Code will be subject to academic penalties under the Code in addition to whatever disciplinary sanctions are applied.

It is expected that some sharing of techniques and/or generic knowledge of hardware components or software will occur between project teams during the semester. However, under no circumstances is there to be sharing of specific circuit designs or software algorithms. Each project team is expected to do all designs necessary for completion of the project independent of other teams. "Sharing" of specific designs amongst teams is considered as grievous as copying on an exam and will be treated as such by the EE Department.

**Accommodating Disabilities**

Reasonable accommodations are available for students with a documented disability. If you have a disability and may need accommodations to fully participate in this class, contact the Office of Student Disability Services: 777-6142, TDD 777-6744, email sasdsc@mailbox.sc.edu, or stop by LeConte College Room 112A. All accommodations must be approved through the Office of Student Disability Services.

**Diversity**

When scheduling exams, I have attempted to avoid conflicts with major religious holidays. If, however, I have inadvertently scheduled an exam or major deadline that creates a conflict with your religious observances, please let me know as soon as possible so that we can make other arrangements.

**Recommended Study Habits**

• Read the assigned material before class.
• Bring thoughtful questions to class for discussion.
• Prepare for the exams in study groups.
• Take notes during class discussions and while completing reading assignments.

**Deviations**

Minor deviations from the syllabus are a normal part of any adaptive teaching and learning process.