ECE 306 Syllabus

Course: ECE 306
Credit Hours: 3
Course Title: Introduction to Embedded Systems

Course Description:

Introduction to designing microcontroller-based embedded computer systems using assembly and C programs to control input/output peripherals. Use of embedded operating system.

Prerequisite(s): ECE 200, ECE 212, ECE 209

Textbook(s) and/or other required material:

- Required: Students will be required to purchase a microcontroller evaluation board with software tools to use for the laboratory; they will keep this board after the class ends for use in other classes (e.g. senior design). The cost per student is expected to be about $70.

- Required: Students will be required to read articles off of the class website.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

1. Recognize and identify the constraints facing embedded system designers, and determine how to assess them.
2. Program a modern microcontroller in assembly language and operate its peripheral devices.
3. Interpret how the assembly code generated by a compiler relates to the original C code.
4. Practice thread-based program design.
5. Develop programs controlling embedded systems using quick and efficient methods.
6. Predict, measure and manipulate a program's execution time.

Topics covered:

Introduction to Embedded Systems and Microcontroller-Based Circuit Design (2)
Microcontroller Instruction Set Architecture (3)
Assembly Language Programming and General Purpose Digital I/O (3)
C Programming Review (2)
C and the Compiler (3)
Debugging Software and Hardware (2)
Threads, Tasks and Simple Scheduling (3)
Threaded Program Design (3)
Using and Programming Interrupts (3)
Real-Time Operating Systems (3)
Serial Communication Peripherals (2)
Digital I/O Peripherals: T/C and PWM (3)
Analog I/O Peripherals (2)
Simulation Design and Debugging (2)
Performance Analysis (2)

Class/laboratory schedule (sessions per week and duration of each session):

2 75 minute class sessions per week.

Contribution of course to meeting the requirements of Criterion 5 - other:

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:
## ECE 306 Syllabus

3 hours.

**Contribution of course to meeting the requirements of Criterion 5 - general education:**

**Relationship of this course to program learning outcomes:**

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Level of Instruction</th>
<th>Related Course Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome A</td>
<td>Major</td>
<td>Students learn concepts of using microprocessors to solve embedded system requirements.</td>
</tr>
<tr>
<td>Outcome B</td>
<td>Major</td>
<td>Students develop and debug assembly and C code in lab experiments, evaluate controller behavior based upon oscilloscope and debugger observations.</td>
</tr>
<tr>
<td>Outcome C</td>
<td>Major</td>
<td>Students design and write software to perform a required function (e.g. a digital oscilloscope).</td>
</tr>
<tr>
<td>Outcome D</td>
<td>Basic</td>
<td>Students can work in two-person groups to complete programs. Student population in course is diverse.</td>
</tr>
<tr>
<td>Outcome E</td>
<td>Major</td>
<td>Students design software to solve engineering problems (data acquisition and analysis, display). (do not duplicate, engineering problem solving: enter a few topics).</td>
</tr>
<tr>
<td>Outcome F</td>
<td>N/A</td>
<td>Homeworks, Reports and Quizzes.</td>
</tr>
<tr>
<td>Outcome G</td>
<td>Major</td>
<td></td>
</tr>
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<tr>
<td>Outcome H</td>
<td>Basic</td>
<td>Students observe impact of microcontroller-based embedded systems on modern society.</td>
</tr>
<tr>
<td>Outcome I</td>
<td>Basic</td>
<td>Students learn benefits of using/keeping up-to-date with modern design and debugging tools.</td>
</tr>
<tr>
<td>Outcome J</td>
<td>N/A</td>
<td>Students use modern toolset (assembler, compiler, simulator, programmer and debugger) for microcontroller evaluation board.</td>
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<tr>
<td>Outcome K</td>
<td>Major</td>
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**Person who last prepared this description and date of preparation:**

- Dean, Alexander G. (agdean) - Sep 21st, 2009 (11:56am)