

# ECE 306 Syllabus

<b>Course:</b>	ECE 306
<b>Credit Hours:</b>	3
<b>Course Title:</b>	Introduction to Embedded Systems
<b>Course Description:</b>	

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:**

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3 hours.

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

## Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	Students learn concepts of using microprocessors to solve embedded system requirements.
Outcome B	Major	Students develop and debug assembly and C code in lab experiments, evaluate controller behavior based upon oscilloscope and debugger observations.
Outcome C	Major	Students design and write software to perform a required function (e.g. a digital oscilloscope).
Outcome D	Basic	Students can work in two-person groups to complete programs. Student population in course is diverse.
Outcome E	Major	Students design software to solve engineering problems (data acquisition and analysis, display). (do not duplicate, engineering problem solving: enter a few topics).
Outcome F	N/A	
Outcome G	Major	Homeworks, Reports and Quizzes.

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

<b>Learning Outcome</b>	<b>Level of Instruction</b>	<b>Related Course Content</b>
Outcome H	Basic	Students observe impact of microcontroller-based embedded systems on modern society.
Outcome I	Basic	Students learn benefits of using/keeping up-to-date with modern design and debugging tools.
Outcome J	N/A	
Outcome K	Major	Students use modern toolset (assembler, compiler, simulator, programmer and debugger ) for microcontroller evaluation board.

**Person who last prepared this description and date of preparation:**

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