

# CIS 4930/6930 Introduction to Embedded Systems

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<b>Office Hour:</b>	Tue. & Thr., 4 – 5pm, or by appointment.
<b>Class Meeting Time/Location:</b>	Tue. & Thr., 2 – 3 : 15pm at ENG 3.
<b>Credit Hours:</b>	3

## Course Description

This course introduces students to the design and analysis of computational systems that interact with physical processes. Applications of such systems include medical devices and systems, consumer electronics, toys and games, assisted living, traffic control and safety, automotive systems, process control, energy management and conservation, environmental control, aircraft control systems, communications systems, instrumentation, critical infrastructure control (electric power, water resources, and communications systems for example), robotics and distributed robotics (telepresence, telemedicine), defense systems, manufacturing, and smart structures.

A major theme of this course is on the interplay of practical design with models of systems, including both software components and physical dynamics. A major emphasis will be on building high confidence systems with real-time and concurrent behaviors.

This course introduces students to the basics of models, analysis tools, and control for embedded systems operating in real time. Students learn how to combine physical processes with computation. A major theme of this course is on the interplay of practical design with models of systems, including both software components and physical dynamics. A major emphasis will be on building high confidence systems with real-time and concurrent behaviors. Topics to be covered include the following:

- Models of computation: finite state machines, threads, ordinary differential equations, hybrid systems, actors, discrete-events, data flow, etc.
- Mapping to embedded platforms: real-time operating systems, memory architectures, execution time analysis, concurrency and multitasking, and scheduling.
- Interfacing with the physical world: sensor/actuator modeling and calibration, concurrency in dealing with multiple real-time streams, handling numerical imprecision in software.
- Basic analysis, control, and systems simulation: bi-simulations, reachability analysis, controller synthesis, approximating continuous-time systems.

## Course Material

**Textbook:** *Introduction to Embedded Systems*, by E. A. Lee and S. A. Seshia, 2011, ISBN 9780557708574. The book is available in three forms: Free PDF download at <http://leeseshia.org>, low-cost paperback, and low-cost hardback that can be purchased from [www.lulu.com](http://www.lulu.com).

## Prerequisites

It is highly desirable that you have successfully finished the main hardware and software related courses to have sufficient background for this course.

## Grading (Tentative)

Homework/Exams	Grades	Date
Homework	20%	N/A
Exam 1	25%	Feb. 2nd, 2012
Exam 2	25%	Mar. 8th, 2012
Final Project	30%	TBD

### Final grading scale:

$< 60\%$	$60\% - 69.9\%$	$70\% - 79.9\%$	$80\% - 89.9\%$	$\geq 90\%$
<b>F</b>	<b>D</b>	<b>C</b>	<b>B</b>	<b>A</b>

- The instructor reserves the right to give +/- letter grades for the final grades.
- The above grading scale may be subject to minor change depending on the overall class performance statistics.
- No incomplete (I) grades will be given.

## Homework Assignments

- Approximately 6 – 8 homework assignments will be given.
- All assignments are individual, and the final submission must be your own work.
- Homework solutions must be submitted via Blackboard. **Submission in any other form will be ignored.**
- Solutions must be typed using a text editor. Figures if used must be drawn using a graphics editor. **Handwritten solutions will not be accepted.**
- There may be additional specific requirements for individual assignments.

## Communication

Blackboard will be the sole means for communications. Grades, assignments, handouts, announcements, and other related materials will be posted only on Blackboard. The following three locations on Blackboard will be used very often during this semester.

- **Course Documents** where lecture material and other related documents are posted
- **Assignments** where assignments are posted and your solutions are submitted. *Anything sent to Digital Dropbox is ignored.*
- **Grade Book** where grades for assignments, exam(s), and the final project are posted.
- **Discussion Board** where questions and answers that are of interest to the entire class are posted.

In addition, your email inbox needs to be cleared because messages broadcast to the whole class will be sent out via announcements and/or emails. **You are responsible for not receiving emails due to the overflow of your email inbox.**

## Policy for Missing Exam and/or Assignments

Late submission of assignments or the make-up exam is granted only when a police report or a doctor's note showing some emergency is presented.

## Academic Integrity/Academic Dishonesty

Students are expected to be honest and not cheat on their assignments/examinations/project. Collaboration and discussion with fellow students are highly encouraged, but copying each other's work is forbidden. Every student should read the University's policies on student conduct, academic dishonesty, etc. Please see the University's Undergraduate Catalog regarding these policies at <http://www.ugs.usf.edu/pdf/cat1011/20102011.pdf>. Students caught cheating in any form will receive an **FF** grade for the course.

**Last Day to Drop with 'W':**

**March 24th, 2012**

## General Policies

- All announcements and assignments will be posted through Blackboard. Students are required to look in Blackboard for course material and related information.

- Class Attendance is required although not monitored. Students are responsible for all information communicated during class. This information will not be necessarily duplicated in the class webpages.
- Academic dishonesty will not be tolerated and the student, in question, will be dealt with in accordance with the University policies.
- Cell phones may not be used as calculators. Cell phones must be turned off at all times including exams and lectures.
- The communication functions including text messaging on all devices must be turned off during exams.
- Students are not allowed to sell or distribute notes provided for this class.
- Students with disabilities are encouraged to consult the Instructor as soon as possible. If accommodations are needed, a letter from the Office of Student Disability Services (SVC 1133) will be required. Please inform the Instructor if there is a need for alternate format for documents or notetaker.
- Students who anticipate the necessity of being absent from class due to the observation of a major religious observance must provide notice of the date(s) in writing by the second class meeting.
- The instructor reserves the right to interpret the class policies if confusions may occur.