ECE 3760 – Digital Systems Design I

Winter 2015

Course Objectives

As the use of computing systems for signal processing and control becomes more widespread, and their operation and inter-device interactions become more complex, it is important that a principled design methodology be followed in the development of such systems. The goal of this course is to provide a logical framework for the design of digital systems with specific emphasis on embedded computing applications.

Course Content

The following topics will be covered:

- The design process as it applies to digital systems;
- Development of a system architecture;
- Modeling of embedded software/firmware;
- Estimating system performance;
- Inter-component communication;
- Multi-processor systems and caching.

Laboratories

Laboratory work may be performed in groups of not more than two students. Each student is required to use a laboratory notebook in which to record information relevant to the conduct of the five laboratories. This includes answers to assigned laboratory questions, working notes, results obtained during the laboratories, and answers to pre-laboratory assignments.

The laboratory notebook must be brought to each laboratory session and must be presented to the laboratory demonstrator for inspection at the completion of each laboratory. The demonstrator will sign the laboratory notebook, indicating that all assigned tasks have been completed. The notebook will be collected following the completion of Laboratory 3 (midterm break) and Laboratory 5 (end of term). In addition, each student will be required to submit two detailed and individual laboratory reports during the course as assigned by the course instructor.

Textbook


Requirements/Regulations

- Attendance at lectures and laboratories is essential for successful completion of this course. Students must satisfy each evaluation component in the course to receive a final grade.

- It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with the University’s General Academic Regulations, as well as Section 3 of the Faculty of Engineering Academic Regulations dealing with incomplete term work, deferred examinations, attendance and withdrawal.

- No programmable devices or systems (such as calculators, PDAs, iPods, iPads, cell phones, wireless communication or data storage devices) are allowed in examinations unless approved by the course instructor.

Important Dates

- Term Tests
  February 9th, 2015
  March 9th, 2015

- Laboratory Reports Due
  February 11th, 2015
  March 30th, 2015

- Voluntary Withdrawal Deadline
  March 19th, 2015

- Mid-term Break
  February 16–20, 2015
  No classes or examinations

- Good Friday
  April 3rd, 2015
  No classes or examinations
Accreditation Details

Attributes
A1: A knowledge base for engineering
A2: Problem analysis
A3: Investigation
A4: Design
A5: Use of engineering tools
A6: Individual and team work
A7: Communication skills
A8: Professionalism
A9: Impact of engineering on society/environment
A10: Ethics and equity
A11: Economics and project management
A12: Life-long learning

Competency Levels
1 - Knowledge (Able to recall information)
2 - Comprehension (Ability rephrase information)
3 - Application (Ability to apply knowledge in a new situation)
4 - Analysis (Able to break problem into its components and establish relationships)
5 - Synthesis (Able to combine separate elements into a whole)
6 - Evaluation (Able to judge the worth of something)

Learning Outcomes
1. Demonstrate the ability to formulate a system architecture composed of microprocessor, FPGAs and supporting components.
2. Demonstrate the ability to design and develop basic embedded software for digital systems.
3. Demonstrate the ability to estimate system performance and resource use, and use this information to evaluate and improve a design.
4. Acquire a working understanding of inter-component communication protocols for embedded applications.
5. Acquire a basic understanding of multiprocessing systems and caching.

Expected Competency Levels

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<tr>
<th>Outcome</th>
<th>A1</th>
<th>A2</th>
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Evaluation
The final course grade is determined by the student’s performance on assignments, in laboratories, and on tests and examinations.

Students must complete all laboratories in order to be eligible to receive a passing grade.

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<tr>
<th>Component</th>
<th>Value (%)</th>
<th>Method of Feedback</th>
<th>Learning Outcomes Evaluated</th>
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<tbody>
<tr>
<td>Assignments</td>
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<td>F, S</td>
<td>1, 3, 4</td>
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<tr>
<td>Laboratories</td>
<td>10</td>
<td>F, S</td>
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<td>Term Tests</td>
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<td>F, S</td>
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<td>Final Examination</td>
<td>50</td>
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* Method of Feedback: F - Formative (written comments and/or oral discussion), S - Summative (numerical grade)

Academic Integrity
Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations on Academic Integrity, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty.

Updated: 07 January 2015