Course Outline

Instructor
Prof. Witold Kinsner, P.Eng.
E3-415 EITC
(204) 474-6490
Witold.Kinsner@umanitoba.ca

Office Hours
• After lectures or by appointment

Teaching Assistant
• David Tarrazas
umterraz@cc.umanitoba.ca
• TBD

Contact Hours
• 4 credit hours
• Lectures:
  3 hours × 13 weeks/term = 39 hours
• Laboratories:
  3 hours × 5 weeks = 15 hours

Prerequisites:
• ECE 3610 Microprocessor Interfacing
• COMP 1012 Computer Programming for Scientists and Engineers
  (or COMP 1010 Introductory Computer Science I)

Course Website:
http://ece.eng.umanitoba.ca/undergraduate/ECE3730/

Important Dates

• Term Test
  February 24th, 2015
  6:00pm – 8:00pm

• 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

ECE 3730 – Principles of Embedded Systems Design  Winter 2015

Course Objectives
This course will introduce students to the design and implementation of embedded systems. Topics include introduction to UML and data structures, A2D, D2A, serial bus architectures (SPI and I2C), embedded computing, bus-based computer systems, program design and analysis, networks, and hardware-software co-design.

Course Content
The following topics will be covered:
• Embedded systems design process and principles
• Formalisms for system design
• Processors and/or FPGA based system implementation
• Inter-component communications
• Program design and analysis
• Data structures

Textbook
Lecture slides.

Other Resources
{ISBN 978-1-111-42625-2}

Alan Clements, Microprocessor Systems Design: 68000 Hardware, Software, and Interfacing. Boston, MA: PWS Computer Science, 1998 (3rd ed.), 978 pp & CD-ROM. In addition to the material covered in the second edition (the 68000; memories; exception handling; serial I/O; buses, designing systems), this third edition includes a chapter on the C programming and its relationship to assembly language, as well as new examples and applications, better representation of timing diagrams, and a CD-ROM with a 68000 cross-assembler and simulator for DOS and Windows, and a cross compiler for C.

Other Supplementary Materials

Books and Data Sheets
Several extensive operation manuals and data sheets will be required.

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
Accreditation Details

Accreditation Units
- Mathematics: 0%
- Natural Science: 0%
- Complementary Studies: 0%
- Engineering Science: 60%
- Engineering Design: 40%

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)

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.

Learning Outcomes
1. Demonstrate the ability to model the design of an embedded system using UML diagrams.
2. Demonstrate the ability to use the C language to write programs for embedded systems.
3. Demonstrate the ability to apply C linked-list, pointer, and data structures in embedded applications.
4. Demonstrate the ability to apply COTS components (A2D, D2A, configurable real-time clock, rotary encoder, LCD, GPIO expander, and FIFO memory) in the design of various embedded systems applications (device tuner, arbitrary waveform generator, signal filter, error detection and correction, and LCD display system).
5. Apply the SPI and I2C inter-component communications protocols in embedded systems.

Expected Competency Levels

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<th>Outcome</th>
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Evaluation

Students must satisfy each evaluation component in the course to receive a final grade. This means that students must complete and pass all laboratories, projects, and examinations to be eligible to receive a passing grade. The final course grade is determined by the student’s performance in the following:

<table>
<thead>
<tr>
<th>Component</th>
<th>Value (%)</th>
<th>Method of Feedback</th>
<th>Learning Outcomes Evaluated</th>
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<tbody>
<tr>
<td>Projects: Laboratories</td>
<td>30</td>
<td>F, S</td>
<td>1, 2, 3, 4, 5</td>
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<td>and Assignments</td>
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<td>Term Tests</td>
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<td>F, S</td>
<td>2, 3, 4, 5</td>
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<td>Final Examination</td>
<td>50</td>
<td>S</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: 04 January 2015