University of Guelph
School of Engineering
Real-Time Systems Design (ENGG*4420)
Fall 2011

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## Instructor: Raef Shehata

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## Teaching Assistant: Matthew Mayhew

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## Lab Technician: Hong Ma

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## Course Schedule:

## 1. Lectures:

MACN, Room 202

Mon, Wed, Fri 3:30 PM - 4:20 PM

## 2. Labs:

THRN, Room 2196

Fri 12:30 PM – 3:20 PM

## Marking Scheme:

- ENGG*4420 is a 0.75 credit course
- Lab marks 40%

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|---|---|
| Lab 1 (8%) | Demo 4%, Report 4% |
| Lab 2 (8%) | Demo 4%, Report 4% |
| Lab 3 (12%) | Demo 6%, Report 6% |
| Lab 4 (12%) | Demo 6%, Report 6% |

- Exam marks 60%

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|---|---|---|
| Midterm 1 (15%) | Covers Chapter 1 | TBA |
| Midterm 2 (15%) | Covers Chapter 2 | TBA |
| Final (30%) | Covers the rest | Dec. 15, 2011 (8:30AM - 10:30AM) |

## Course Description:

This course is designed as a senior undergraduate course for the School of Engineering. The goal of this course is to teach students real-time concepts from a “system and computing” perspective and to provide students with comprehensive approach, background, and skills to apply these concepts to engineering applications. The course covers modeling, designing, and building real-time systems using embedded computers.

# Course Outline:

## 1. Lectures:

**Chapter 1:** Real-Time Computer Control

- Real-Time Definitions and Development
- Dynamic Models
- Feedback Control, PID, and Tuning
- Implementing Real-Time Control Algorithms

**Chapter 2:** Real-Time Operating Systems Concepts

- Introduction
- Common Kernel Objects
- µC/OSII and VxWorks Concepts and Examples
- PIP and PCP Protocols

**Chapter 3:** LabVIEW Real-Time System Development

- Data Acquisition
- Real-Time LabView

**Chapter 4:** Scheduling

- Uni/Multi-processor Scheduling Algorithms
- Real-Time Control Scheduling

**Chapter 5:** Real-Time System Modeling using Petri Nets

**Chapter 6:** Safety and Reliability Issues in Real-Time Systems

## 2. Labs:

**Lab 1:** Modeling the PT 326 Process Trainer System

**Lab 2:** Real-Time Automotive Suspension System Simulator

**Lab 3:** Real-Time Control of a Hot Air Plant

**Lab 4:** Multi-Core Real-Time Suspension Controller

## Laboratory Requirements

- Lab manual (Bookstore for $11)
- Labs start on Friday September 16th, 2011.
- Understand lab theory and examples
- Execute all lab procedures
- Submit a lab report (8-15 pages)
- Follow the report outline given in the lab manual:
    - Introduction and background should be short
    - The main focus should be on the lab implementation, results' discussion, and analysis
- Demo your lab implementation, your demo needs to operate to all design requirements for full mark
- The lab mark for each group member depends on his/her performance within the group
- DO NOT copy your labs. The copied labs will be reported
- Students must sign the "Work Evaluation Form" and submit it to the TA

## Important Notes:

- To pass the course, students have to finalize and submit all the labs (Demo and Report) and obtain passing marks in all the labs and (the final exam or both midterms). If the final exam and at least one midterm exam have marks below 50% then the final course mark will be the average of exams out of 100% (lab marks will not be considered).
- The labs and midterms marks must be contested within 3 days after submission, otherwise the marks will be final and no later mark contests will be considered.
- Communications regarding the course will involve the course webpage and email. Please check them regularly.
- Please present authentic work during the course. Copied labs or exams will be reported.
- Make-up Tests: Only with valid doctor note stating that you were ill and needed to stay home.

## Missed Test or Late report Policy:

- In case of a missed test, a formal written explanation must be made to the instructor as soon as possible. Otherwise, exams will receive a grade of zero.
- In case of a late report:
  - 25% will be deducted if report is up to 24 hours late
  - 50% will be deducted if report is up to 48 hours late
  - No reports will be accepted after that

## University Policy on Academic Misconduct:

Academic misconduct, such as plagiarism, is a serious offence at the University of Guelph. Please consult the Undergraduate Calendar 2011-2012 and School of Engineering programs guide, for offences, penalties, and procedures related to academic misconduct.
http://www.uoguelph.ca/registrar/calendars/undergraduate/2011-2012/c08/c08-amisconduct.shtml

## Disclaimer

The Instructor reserves the right to change any or all of the above (lab schedules, due dates, exam dates, marking schemes, etc.) in the event of appropriate circumstances, subject to the University of Guelph Academic Regulations.