# ECSE 421: Embedded Systems
# Course Outline

Winter 2013

An embedded system is any computer system embedded in a larger product for the purpose of monitoring or controlling some part of the larger system. Embedded systems, unlike general-purpose computer systems, are highly optimized to deliver the best application-specific performance possible under a wide and varying set of constraints. In this course, we will cover the basic elements of embedded system design, including system specification and modeling, the components of embedded hardware and software, and techniques for system validation, evaluation, and optimization. The goal of this course is to familiarize students with each of these aspects of embedded system design and both their relationship with one another and with design and optimization as a whole.

**Staff**

Instructor    Professor Brett H. Meyer, brett dot meyer at mcgill.ca, x4210
              OH: Tuesdays 10-11 AM, Thursdays 2-3 PM, and by appointment, in MC525

Assistant     Chuansheng Dong, chuansheng dot dong at mail.mcgill.ca

**Hours and location**

Lectures      TR      8:35-9:55 AM, BURN 1B45
Tutorial      F       12:35-1:25 PM, ENGTR 0100

**Prerequisites**

ECSE 322: Computer Engineering, ECSE 323: Digital System Design

**Course Materials**

Course materials will be made available on MyCourses throughout the semester.

> *Instructor generated course materials (e.g., handouts, notes, summaries, exam questions, etc.) are protected by law and may not be copied or distributed in any form or in any medium without explicit permission of the instructor. Note that infringements of copyright can be subject to follow up by the University under the Code of Student Conduct and Disciplinary Procedures.*

**Text**

Peter Marwedel, *Embedded System Design: Embedded System Foundations of Cyber-Physical Systems*, 2nd edition, Springer, 2011.

The text is available for free download and hard copies are available at a reduced priced (courtesy the McGill University Library). See the MyCourses site for PDF versions of the chapters and instructions for acquiring hardcopy. The text is also on reserve at the Schulich Library.

**Topics**

1. System Specification and Modeling
2. Embedded System Hardware
3. System Software
4. Evaluation and Validation
5. Application Mapping
6. Optimization
7. Test (time permitting)

**Evaluation**

*McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest for more information).*

*In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.*

*If you have a disability please contact the instructor to arrange a time to discuss your situation. It would be helpful if you contact the Office for Students with Disabilities (www.mcgill.ca/osd) at 514-398-6009 before you do this.*

There are six homework assignments, one midterm exam, a semester-long project, and a final exam. The approximate grading breakdown is:

- Homework     10%
- Midterm      20%
- Project       30%
- Final          40%

We reserve the right to change these weights based on class performance.

*Homework*: Homework sets are due at 11:59 PM on their due date and must be submitted using MyCourses. No credit will be given for late work without prior permission. Homework grades will be assigned based perceived effort toward the completion of the problems rather than the correctness of the solution.

*Exams*: The midterm exam will be held in class on **February 21st, 2013**. The final will be a 3-hour cumulative exam, administered according to the University's calendar. All exams are closed book. A crib sheet is allowed (one page, both sides, for the Midterm; two pages, both sides, for the Final). *All crib sheets must be hand-written.*

*Project*: The semester project will be to specify, model, design and test an embedded system. This project will require you to work in groups of four and meet periodic design milestones spaced throughout the semester. See the Project Materials module in MyCourses for more information.

*Re-grading*: Students must submit any re-grading request in writing, making a comparison of their work and the solutions, and justifying their request for additional marks. At the instructor's discretion, either the problem in question or the entire assignment or exam may be re-graded.