Course Objectives
The course presents real-time wired and wireless interfacing of microcontrollers, microprocessors, and microcomputers to the external world, including interfacing of I/O devices with minimum hardware and software, data acquisition with and without microprocessors, data communications, transmission and logging with embedded computers.

Prerequisites
ECE 2160 Electronics 2E
ECE 3610 Microprocessing Systems

Course Content
The following topics will be covered:
- Introduction on computing, architectures, processors, and technologies
- Bus architectures
- Digital I/O
- D/A and A/D signal conversions and converters
- Interfacing aspects in data communications
- Updates on new concepts, technologies, protocols, and software
  - Demos: Examples of bus architectures, modules, systems, and new devices.
  - Updates on new computer concepts, technologies, protocols, and software.

Accreditation Units
Mathematics: 0%
Natural Science: 0%
Complementary Studies: 0
Engineering Science: 30%
Engineering Design: 70%

Web Page
http://ece.eng.umanitoba.ca/undergraduate/ECE4240

Textbook

Other References
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. {QA76.8.M67C48 1997; ISBN 0-534-9482-7}.

Other Supplementary Material

Books and Data Sheets
The library has many other books covering different aspects of microprocessor and microcomputer interfacing. Laboratory write-ups provide detailed description of the devices used. Data sheets should also be consulted for specific parameters of the devices. As usual, information on current developments in interfacing is published in numerous technical magazines and journals, including:

**Magazines (examples)**

**Journals (examples)**

Evaluation Details
The final course grade is determined by the student’s performance on assignments, in laboratories, in two midterm tests, and on the final examination. Students must complete all the laboratories in order to be eligible to receive a passing grade.

Mid-Terms
Friday, October 17, 2014 (in class)
Monday, November 17, 2014 (in class)

Instructor
Prof. Witold Kinsner, PhD, PEng
Room: E3-415 EITC
Telephone: (204) 474-6490
Email: witold.kinsner@umanitoba.ca

Office Hours
After lectures or by appointment.

Teaching Assistants
TBA

Voluntary Withdrawal Date
Wednesday, November 12th, 2014.

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 Sections 4 and 6 of the 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
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 and Requirements of the University of Manitoba, Section 7.1, students are reminded that plagiarism or any other form of cheating in examinations, assignments, laboratory reports or term tests is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty.

Learning Outcomes
1. Describe the role of the essential elements of interfacing in real-time systems.
2. Analyze the best techniques for synchronization in digital systems.
3. Analyze and design the best techniques for analog-to-digital conversion (DAC).
4. Analyze and design the best techniques for digital-to-analog conversion (ADC).
5. Analyze and design modern data transmission systems in the presence of noise.
6. Analyze and design simple error detection and correction systems.
7. Solve open-ended problems of data transmitting data in the presence of noise.

Expected Competency Level **

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<thead>
<tr>
<th>Learning Outcome</th>
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*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 (Able to rephrase information)
3 - Application (Able 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 whole)
6 - Evaluation (Able to judge of the worth of something)

Student Contact Time (Hrs)
Lectures: 3 hrs lecture/week × 13 weeks/term = 39 hrs
Laboratories: 3 hrs laboratory × 5 weeks = 15 hrs
Tutorials: 0 hr tutorial × 0 weeks = 0 hrs
**Evaluation**

<table>
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<tr>
<th>Component</th>
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<th>Methods of Feedback *</th>
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* Methods of Feedback: F - *formative* (written comments and/or oral discussion), S - *summative* (number grades)