ENGINEERING 9865: Advanced Digital Systems

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Communication: Email, course website, and bulletin board on the course website.

COURSE DESCRIPTION:
This course includes concepts, language, tools, and issues pertaining to specification, modelling, analysis, simulation, testing and synthesis of digital systems, including PLD, FPGA, and ASIC devices. Industry standard CAD tools will be used in this course to facilitate system design and testing.


SCHEDULE:
LECTURE: Friday 2:00 - 5:00 pm, Room: EN-1001
TUTORIAL: to be determined

CREDIT VALUE: 3 credits

RESOURCES:
TEXT BOOK

REFERENCES
ENGI 9865 Advanced Digital Systems
Winter 2015-2016

MAJOR TOPICS:
The topics will include, but not be limited to:

- Concepts of Digital Logic and Principles of Digital Circuits Design
- Advanced Minimization Techniques
- Design of Logic Circuits with Programmable Logic Devices (PLDs, FPGAs)
- Introduction to ASICs and ASIC Design Methodology
- Analysis, Modeling and Partitioning for Logic Synthesis and VHDL Coding
- Constraining Designs, Synthesizing, Simulation and Optimization
- Design with Asynchronous Boundaries
- Digital Design for Broadband Multicast Switches
- Design for Testability, Built-In Self-Test, and Fault Tolerance
- Digital System Reliability
- Noise and Transmission Line Effects

Computer-Aided Design Tools:

LEARNING OUTCOMES:
Upon successful completion of this course, the student will be able to:

- Understand the design methodology and conduct design for large digital systems
- Master VHDL language and learn to use Industry standard CAD tools for digital design
- Understand DFT, BIST, and miscellaneous aspects of digital system
- Prototyping and testing a design using Altera/Xilinx FPGA development kits

ASSESSMENT:

<table>
<thead>
<tr>
<th>Task</th>
<th>Weight (%)</th>
<th>Due Dates</th>
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<tbody>
<tr>
<td>Problem Sets (4)</td>
<td>0%</td>
<td>Jan. 29, Feb. 12, Mar. 4, Mar. 18.</td>
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<tr>
<td>Midterm Exam</td>
<td>20%</td>
<td>February 19</td>
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<td>Mini-Labs (3)</td>
<td>6%</td>
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<tr>
<td>Design Project</td>
<td>29%</td>
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<tr>
<td>Final Exam</td>
<td>45%</td>
<td>April 15 – 20</td>
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IMPORTANT DATES:

- Problem Sets: Jan. 29, Feb. 12, Mar. 4, Mar. 18.
- Project Proposal: Jan. 22
- Mid-Term: February 19, 3:00 – 4:30 PM (Tentative)
- Project Meeting: Week of Feb. 29 - Mar. 4, 2016 (Venue TBA.)
- Project Presentation: Weeks of Mar. 14-25, 2016 (Venue TBA.)
- Project Demo: Weeks of Mar. 14-25, 2016 (Venue TBA.)
- Project Report: Apr. 8, 2016
SUGGESTED DESIGN PROJECT TOPICS (NOT LIMITED TO):

- General purpose and application specific processors, e.g., DLX, MIPS, DSP, and Grid Computing Processor.
- Digital Filters.
- Algorithms Implementations, e.g., BIST, Sorting, Routing, and Buffer Control.
- Reconfigurable Architectures.
- Parallel Processing
- Implementations on Altera/Xilinx FPGA development systems are highly preferred
- Implementations of security algorithms

OTHER NOTES:

- Best Project Awards:
The best 1-2 projects (in terms of novelty, achievements, presentation, and report) will be awarded 2 bonus marks for each individual. I will sponsor selected projects for possible NECEC’16 publication from my grant.

- Academic Dishonesty:
Academic dishonesty will not be tolerated. Reference to other people’s work must be clearly specified and cited. The work in question will receive a grade of zero, and a formal process might be started. Be very careful of falling prey to plagiarism or any form of academic dishonesty.

ACADEMIC INTEGRITY AND PROFESSIONAL CONDUCT:
Students are expected to conduct themselves in all aspects of the course at the highest level of academic integrity. Any student found to commit academic misconduct will be dealt with according to the Faculty and University practices. More information is available at www.engr.mun.ca/undergrad/academicintegrity.

Students are encouraged to consult the Faculty of Engineering and Applied Science Student Code of Conduct at http://www.engr.mun.ca/policies/codeofconduct.php and Memorial University’s Code of Student Conduct at http://www.mun.ca/student/conduct.

LAB SAFETY:
Students are expected to demonstrate awareness of, and personal accountability for, safe laboratory conduct. Students will immediately report any concerns regarding safety to the teaching assistant, staff technologist, and professor.

INCLUSION AND EQUITY:
Students who require physical or academic accommodations are encouraged to speak privately to the instructor so that appropriate arrangements can be made to ensure your full participation in the course. All conversations will remain confidential.
The university experience is enriched by the diversity of viewpoints, values, and backgrounds that each class participant possesses. In order for this course to encourage as much insightful and comprehensive discussion among class participants as possible, there is an expectation that dialogue will be collegial and respectful across disciplinary, cultural, and personal boundaries.

**STUDENT ASSISTANCE:**
Student Affairs and Services offers help and support in a variety of areas, both academic and personal. More information can be found at [www.mun.ca/student](http://www.mun.ca/student).