Department of Electrical and Computer Engineering
Faculty of Engineering and Applied Science

ECE 3500: Digital Logic

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CALENDAR ENTRY:

3500 Digital Logic includes number systems and Boolean algebra; minimization techniques for Boolean functions; basic combinational logic circuit analysis and design; flip-flops, state machine design and implementation; decoders, multiplexers, registers, counters; simple arithmetic and logic units (ALUs); digital system design of small systems.

     CR: the former ENGI 3861
     PR: ENGI 1040
     LH: Six 3-hour sessions per semester
     OR: Twelve 1-hour tutorial sessions per semester

PREREQUISITES: ECE 1040 **OR** Physics 2055 (Minor in Applied Science Electrical Eng.)

SCHEDULE:

          LECTURE: Tuesday and Thursday, 2:00 –3:30 PM
               Room: Online
          TUTORIAL: Wednesday, 9:00 – 10:00 am (Online)
          LABORATORY: Tuesday and Thursday, 9:00 – 12:00 PM (Online)

CREDIT VALUE: 3 credit hours

COURSE TYPE: Elective

LAB TYPE:

All labs will be MATLAB or other software-based. There will be five labs in total. All details and instruction related to the labs will be shared separately.

The first lab will be on 22nd September, then every alternative week, the lab will be conducted. Lab Reports will be due after one week of each lab.

Lab 1: Introduction to Matlab and Multisim-22 September 2020
Lab 2: Design and analysis of logic gates using Matlab /Multisim -06 October 2020
Lab 3: Design and analysis of Combinational Logic Devices using Matlab/Multisim -27 October 2020
Lab 4: Design and analysis of flip flops using Matlab/Multisim-10 November 2020
Lab 5: Design and analysis of counters using Matlab/Multisim-24 November 2020

ACCREDITATION UNITS:
Contact hours/week: **3/1.5/1**

CONTENT CATEGORIES: (expressed as %, no category can be $0 < c < 25$)

Math	Natural science	Complementary Studies	Engineering Science	Engineering Design
			50%	50%

RESOURCES:

TEXTBOOK AND REFERENCES
- John F. Wakerly, Digital Design: Principles and Practices, 5th ed., Prentice Hall, 2018.
- Digital Design, 5th Edition, M. Moris Mano, Prentice Hall, 2012.
- Thomas L. Floyd, Digital Fundamentals: A Systems Approach, Pearson 2013.
- Lecture Notes and Handouts
- IEEE Explore, http://ieeexplore.ieee.org/Xplore/home.jsp

MAJOR TOPICS:
(1) Introduction

- Why Digital? History, Concept of Gates, Binary Representation

(2) Combinational Logic Design

- Truth Tables and Gates, Boolean Algebra, Analysis of Circuits, Minimization

(3) Digital Circuits

- CMOS Transistors and Gates, Electrical Characteristics of Gates, Hazards

(4) Combinational Logic Devices

- Decoders and Encoders, Multiplexers and Demultiplexers, Programmable Logic Devices

(5) Arithmetic Devices

- Representations of Numbers, Addition and Subtraction, Codes, Adders and Subtractors, Parity Circuits, Comparators

(6) Sequential Logic Design

- Flip Flops, Analysis and Design of State Machines

(7) Sequential Logic Devices

- Registers, Shift Registers, Counters, Sequential Programmable Logic Devices

(8) Digital System Design

- Datapath and Controller Design, Design Examples

ASSESSMENTS:

		Approximate Due Dates
Quizzes(3)	15%	
Quiz 1		September 29
Quiz 2		November 10
Quiz 3		December 2
Assignments (4)	15%	
Assignment 1		September 24
Assignment 2		October 15
Assignment 3		November 19
Assignment 4		December 3
Midterm	20%	October 22
Laboratory	15%	Five Labs (Biweekly)
Final Exam	35%	TBA (Dec 9-Dec 18)

LEARNING OUTCOMES:

Course Level Graduate Attribute Focus: KB-I, Inv.-D, Des.-D

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

	LEARNING OUTCOMES	**GRADUATE ATTRIBUTES. LEVEL OF COMPETENCE**	**Methods of Assessment**
1	Demonstrate knowledge of number systems & codes, Boolean algebra.	KB.5-I	Tests, Exam
2	Demonstrate knowledge of practical characteristics of CMOS gates.	KB.5-I	Tests, Exam

3	Demonstrate knowledge of combinational and sequential logic design methods.	KB.5-I, Des.3-D	Labs, Tests, Exam
4	Analyze digital systems with combinational and sequential logic parts and devices.	KB.5-I, PA.2-D, Des.3-D	Tests, Exam
5	Demonstrate knowledge and proper use of the digital design process.	KB.5-I, Inv.1-D, Des.1-D	Labs, Tests, Exam
6	Implement digital circuits using Softwares	Inv.2-D, Des.3-D Team.1-I	Labs
7	Develop skills in troubleshooting digital circuits using basic tools.	Inv.2-D, Des.3-D Team.1-I	Labs

Each graduate attribute for each learning outcome is rated at a content instructional level of I=Introductory, D=Developed, or A=Applied.

See http://www.mun.ca/engineering/undergrad/graduateattributes.pdf for more information on the 12 Graduate Attributes you are expected to be proficient in upon graduation.

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
http://www.mun.ca/engineering/undergrad/academicintegrity.php

Students are encouraged to consult the Faculty of Engineering and Applied Science Student Code of Conduct at http://www.mun.ca/engineering/undergrad/academicintegrity.php and Memorial University's Code of Student Conduct at http://www.mun.ca/student/conduct/.

INCLUSION AND EQUITY:
Students who require accommodations are encouraged to contact the Glenn Roy Blundon Centre, http://www.mun.ca/blundon/about/index.php. The mission of the Blundon Centre is to provide and co-ordinate programs and services that enable students with disabilities to maximize their educational potential and to increase awareness of inclusive values among all members of the university community.

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