CAMOSUN COLLEGE
Trades and Technology
Electronics and Computer Engineering

ELEN 163
Apply Digital Theory

Winter 2021

COURSE OUTLINE

The calendar description is available on the web @   http://camosun.ca

Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.

1. Instructor Information

(a) Instructor	Ian Cameron		
(b) Office hour	TBD		
(c) Location	TEC 211		
(d) Phone	250-370-4439	**Alternative:**	
(e) E-mail	cameron@camosun.ca		
(f) Website			

2. Intended Learning Outcomes

Explain the Principles of Digital Logic

Explain the Principles of Number Systems and Codes

Explain the Principles of Logic Gates and Boolean

Explain the Principles of Combinational Logic

Explain the Principles of Combinational Logic

Explain the Principles of Digital Arithmetic

Explain the Principles of Counters and Registers

Explain the Principles of MSI Logic Circuits

3. Required Materials

1. Access to Camosun D2L online course materials – Notes, labs, and assignments

2. Lab components – Digital ICs, breadboards, logic probes, connecting wire

3. Exams and quizzes – provided as the course progresses

4. Course Content and Schedule

Time: 94 hours including lectures, labs and exam.

Week 1.   **Introduction to Digital Systems**
- a. Analog vs Digital
- b. Types of Digital Systems

Week 2.   **Describing Combinatorial Logic Systems**
- a. Number Systems and Conversions
- b. Logic Variables
- c. The Truth Table

Week 3.   **Logic Families and Signals**
- a. Digital ICs and Logic Families
- b. Introduction to Digital ICs
- c. Logic Voltage Levels
- d. Variable Names, Signal Names, and Active Levels
- e. The State Indicator
- f. The Logic Probe
- g. Providing Logic Levels with Switches

Week 4.   **Logic Operations and Gates**
- a. Basic Gate Operations – AND, OR, NOT
- b. Logic Symbols for Real Devices
- c. IEEE Symbols
- d. Naming Gates
- e. Gate Duality
- f. LEDs
- g. Hardware Examples
- h. Truth Table vs Function Table

Week 5.   **Analysis of Combinational Logic Circuits**
- a. Describing Logic Circuits Algebraically
- b. Evaluating Circuit Outputs
- c. Boolean Theorems
- d. Sum-of-Products
- e. Truth Tables from SOP

Week 6 – Reading Break

Week 7.   **Analysis of Combinational Logic Circuits cont.**
- f. Use of Alternate Symbols
- g. Fault Finding Combinational Logic Circuits

        IC Parameters
- a. Current Demand
- b. IC Voltage and Current Parameters
- c. IC Specifications and Fan-Out

Week 8.   **Common Circuit Configurations**
- a. Encoders / Decoders
- b. Multiplexers
- c. De-Multiplexers
- d. Data Bussing and Tri-State Logic

        Term Exam #1

Week 9.   **Digital Arithmetic**
a. Binary Arithmetic
b. 2's Complement
c. Binary Adders
d. Binary Subtractors
e. 4-Bit Variations

Week 10   **Sequential Logic Concepts**
a. Sequential Logic Definition
b. Clock Signals
c. One-Shots

Week 11.   **Flip Flops**
a. RS Flip-Flop
c. D-Type Flip-Flops
d. JK Flip-Flops
e. Switch Debounce
f. Flip-Flop Timing Considerations
g. Examples

Week 12.   **Registers**
a. Data Registers and Memory
b. Register Data Transfer
c. Load and Circulate Operations
d. IC Registers

     Term Exam #2

Week 13.   **Counters**
a. Asynchronous Counters
b. Frequency Division
c. Synchronous Counters
d. Cascaded Counters
e. Digital Counter Applications
f. IC Counters

Week 14   **Review for Final**

5. Basis of Student Assessment (Weighting)

a)	Assignments	10
b)	Quizzes	10
c)	Term Tests	30
d)	Final Exam	40
e)	Labs	10

Please note the following:

1. A grade of 60% or better is required in all assessment items above for this course pass.
2. Labs are due at the end of the lab period. A grade of 0% will be awarded to late labs.
3. Assignments are due by Sunday midnight of the current week through D2L Dropbox.
4. No late materials will be accepted past midnight of the last day of the course.
5. No opportunity will be available to write missed quizzes.
6. Inform the instructor prior to being late or missing a class, or as soon as possible.

6. Grading System

X	Standard Grading System (GPA)

	Competency Based Grading System

7. Recommended Materials or Services to Assist Students to Succeed Throughout the Course

LEARNING SUPPORT AND SERVICES FOR STUDENTS

> There are a variety of services available for students to assist them throughout their learning. This information is available in the College Calendar, Student Services or the College web site at http://www.camosun.bc.ca

STUDENT CONDUCT POLICY

> There is a Student Conduct Policy. It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, Registration, and on the College web site in the Policy Section.
> http://www.camosun.bc.ca/policies/policies.html

8. College Supports, Services and Policies

Immediate, Urgent, or Emergency Support
If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @ http://camosun.ca/about/mental-health/emergency.html or http://camosun.ca/services/sexual-violence/get-support.html#urgent

College Services
Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at http://camosun.ca/

College Policies

Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at http://camosun.ca/about/policies/. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment,