CAMOSUN COLLEGE
School
Department

Course Abbreviation, Number & Title ***(long title, or short if no long title)***
Term & Year
(2020 winter)

COURSE OUTLINE

The calendar description is available on the web @ www.camosun.ca

Ω *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	John Yang		
(b) Office hours	TBD		
(c) Location	TEC 268		
(d) Phone	(250) 370-4213	**Alternative:**	
(e) E-mail	yang@camosun.bc.ca		
(f) Website	http://camosun.ca/learn/programs/electronics-computer-engineering-technolog		

2. Intended Learning Outcomes

(If any changes are made to this part, then the Approved Course Description must also be changed and sent through the approval process.)

Upon completion of this course the student will have a complete understanding of DC and AC circuit operation, including the analysis of circuits containing capacitors and inductors.

3. Required Materials

(a) Texts

- **Introduction to Circuit Analysis**
  Walls Johnstone ISBN 0-314-93386-7

(or)

- **Circuit Analysis with Devices** 2nd Edition (or newer)
  Robbins and Miller ISBN 140187984-5

(b) Other

- **Laboratory Exercises, Handouts and Course Outline**

4. Course Content and Schedule

(Can include: Class hours, Lab hours, Out of Class Requirements and/or Dates for quizzes, exams, lecture, labs, seminars, practicums, etc.)

1. Introduction (review) (1 hour)

    1.1 SI Units
    1.2 Scientific Notation and Engineering Notation

2 Nature of Electricity (review) (1 hour)

    2.1 Theory of Electrical Charge
    2.2 Structure of the Atom
        2.2.1 Bohr's Model and Structure of atoms and ions
        2.2.2 States of Matter and Bonding
    2.3 Conductors, Insulators and Semi-Conductors
    2.4 Conventional versus Electron Current Flow
    2.5 Definition of the Coulomb, Ampere, Volt and Ohm

3. Resistance (3 hours)

    3.1 Types of Resistors including Linear Resistors and Non-Linear Resistors
    3.2 Resistor Color Code
    3.3 Ohm's and Watt's Law
    3.4 Work, Energy, Power in Resistive Circuits

4. Resistive Networks and Simple Circuit Analysis (7 hours)

    4.1 Series Circuits
    4.2 Kirchhoff 's Voltage Law (KVL)
    4.3 Voltage Divider Rule
    4.4 Parallel Circuits
    4.5 Kirchhoff's Current Law (KCL)
    4.6 Current Divider Rule
    4.7 Series - Parallel Circuits
    4.8 The Voltage Divider – two resistors, a potentiometer
    4.9 Voltmeter, Ammeter, Ohmmeter and other DC Measuring Instruments
    4.10 Wheatstone Bridge Circuit
    4.11 Delta - Wye Conversions

5. Circuit Analysis using Basic Network Theorems (9 hours)

    5.1 Equivalent Circuits
    5.2 Constant Voltage Sources
    5.3 Practical Voltage Sources
    5.4 Internal Resistance
    5.5 Constant Current Sources
    5.6 Current Sources in Parallel and Series
    5.7 Maximum Power Transfer Theorem

5.8 Thevenin's Theorem
5.9 Norton's Theorem* (optional)
5.10 Superposition Theorem
5.11 Mesh Current Analysis

6. Capacitance (2 hours)

6.1 Electric Fields
6.2 Electrostatic Induction
6.3 Dielectrics
6.4 Capacitance
6.5 Capacitors in Series
6.6 Capacitors in Parallel

7. Capacitance in DC Circuits (7 hours)

7.1 Charging/Discharging
7.2 Time Constant
7.3 Stored Energy
7.4 Capacitor Response to step and rectangular inputs
7.5 Capacitor as an Integrator and Differentiator

8. Inductance (2 hours)

8.1 Electromagnetic Inductance
8.2 Faraday's Law
8.3 Lenz's Law
8.4 Self-Inductance
8.5 Inductors in Series
8.6 Inductors in Parallel

9. Inductance in DC CIRCUITS (4 hours)

9.1 Rise/Fall of Current in an RL Circuit
9.2 Time Constant
9.3 Stored Energy
9.4 RL Circuit Response to a Step input

10. Introduction to Alternating Current (4 hours)

10.1 Sine Wave Generation and Phase Relationships
10.2 Period, Frequency and Phasor Representations of Sine Waves
10.3 Purely Resistive AC Circuits
10.4 Peak, Average, and Effective (RMS) Value of A Sine Wave
10.5 Other Types of Periodic Waveforms

11. Capacitance in AC Circuits (5 hours)

11.1 Capacitive Reactance
11.2 Analysis of Series RC Circuits
11.3 Analysis of Parallel RC Circuits
11.4 Power in a Capacitive Circuit

12. Inductance in AC Circuits (5 hours)

12.1 Inductive Reactance
12.2 Analysis of Series RL Circuits
12.3 Analysis of Parallel RL Circuits
12.4 Power in an Inductive Circuit

13. Non Resonant AC Circuits (4 hours)

13.1 Analysis of Series RLC Circuits
13.2 Analysis of Parallel RLC Circuits
13.3 Power in an RLC Circuit

14. Resonant AC Circuits (6 hours)

14.1 Series Resonance
14.2 Quality Factor & Selectivity in A Series Resonant Circuit
14.3 Parallel Resonance
14.4 Quality Factor & Selectivity in A Parallel Resonant Circuit

15. Transformers (4 hours)

15.1 Theory of Operation - Mutual Inductance
15.2 Iron, Air, and Ferrite Core Transformers
15.3 Voltage and Current Ratios
15.4 Reflected Impedance
15.5 Transformer Losses

16. Filters (6 hours)

16.1 Low Pass Filters
16.2 High Pass Filters
16.3 Gain, Attenuation, Decibel, Decade, and Octave
16.4 Normalized Frequency Response Curves vs. Bode-plots
16.5 Band Pass Filters
16.6 Band Reject Filters (or Notch Filters)

Total In-Class Theory Hours *(including quizzes, term exams)* **70 hours**

LABORATORY EXERCISES

There will be a total of 13 lab exercises to be completed, one per week of the semester. Each exercise will be of 2 hours duration and all must be completed satisfactorily in order to gain a credit for ELEN 142. All labs will be handed out during class in the week prior to the exercise and preparation must be completed by the student before the start of the lab.

1. Introduction to Multisim
2. Breadboards, Resistors and Simple Circuit Construction
3. Simple Series Circuit and Voltage Divider
4. Parallel and Series-Parallel Circuits
5. DC Network Theorems
6. DC Capacitive Circuits
7. DC Inductive Circuits
8. Introduction to AC Measurements
9. AC Measurements in a Series RC Circuit
10. Amplitude, Phase Angle and Power in a Series AC Circuit
11. Resonant and Non-Resonant RLC Circuits
12. Transformer Characteristics
13. Filters

5. Basis of Student Assessment (Weighting)

(Should be directly linked to learning outcomes.)

Assignments, Quizzes and Tutorials	15%
Labs (13)	15%
Term Exams (2)	30%
Final Exam	40%
Total Course Mark	100%

Other (e.g. Project, Attendance, Group Work)

6. Grading System

(If any changes are made to this part, then the Approved Course description must also be changed and sent through the approval process.)

(Mark with "X" in box below to show appropriate approved grading system – see last page of this template.)

[x] Standard Grading System (GPA)

[ ] Competency Based Grading System

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

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, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

A. GRADING SYSTEMS *http://camosun.ca/about/policies/index.html*

The following two grading systems are used at Camosun College:

1. Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2

50-59	D		1
0-49	F	Minimum level has not been achieved.	0

2. Competency Based Grading System (Non GPA)

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

Grade	Description
COM	The student has met the goals, criteria, or competencies established for this course, practicum or field placement.
DST	The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement.
NC	The student has not met the goals, criteria or competencies established for this course, practicum or field placement.

B. Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy at http://camosun.ca/about/policies/index.html for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	*Incomplete*: A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	*In progress*: A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course.
CW	*Compulsory Withdrawal*: A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.