CAMOSUN COLLEGE
Trades and Technology
Electronics and Computer Engineering

ECET149
Electricity and Machines

Winter 2019

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.

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1. Instructor Information

(a) Instructor	Lindsay Stretch		X02B Lab: Phil Vreugdenhil
(b) Office hours	TBD		
(c) Location	TEC 216		CBA 122A
(d) Phone	250-370-4650	**Alternative:**	
(e) E-mail	Stretch@camosun.ca		VreugdenhilP@camosun.ca
(f) Website	https://idp.camosun.ca		

Pre-requisites

- "C+" in Pre-calculus 12, or Principles of Math 12; or "C" in MATH 107, or MATH 115, or MATH 173*; or assessment; and
- Submit proof of a letter grade of "C" or higher in Physics 12, or PHYS 104*.
  ** These courses are part of the Technology Access Program.*

Course Hours Lecture: 3hrs/wk Lab: 2hrs/wk Duration: 14 weeks

2. Intended Learning Outcomes

Students will be introduced basic electrical theory, practice and devices. Topics include; resistance, capacitance, inductance, D.C. and A.C. circuits, the fundamentals of AC and DC electrical motors, generators, electrical voltage conversion and transmission. An introduction of electricity and magnetism will be provided as well as practice in electrical measurement. Topics covered will be, in part, electromechanical energy conversion, synchronous machines, induction machines, DC machines and special purpose motors, motor selection and speed control techniques.

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

- Describe Voltage, Current and Resistance
- Calculate and measure the current in circuit made up of a battery and resistors
- Describe Capacitors and Inductors
- Understand the basic principles of the electromechanical energy conversion.
- Explain general principles electric machine operation: DC, AC (single phase, three phase, synchronous, induction)
- Understand the basics of speed control in motors.
- Understand and use transformers for basic voltage conversion
- Be able to identify the voltages and number of phases available to a site based on observations of local transmission lines and electrical entry name plate data.
- Describe methods of producing electricity
- Describe how AC power is produced and distributed to buildings
- Understand the concept and techniques for generation of rotating magnetic field.
- Explain the operation of synchronous machines.
- Explain speed control speed of a synchronous or induction motor using a variable frequency drive.
- Explain basic characteristics of induction motor.
- Select induction motor for different applications (Name plate data: voltage, phases, speed, power)
- Understand problems at motor starting and variable speed operation.
- Understand commutation process in DC machines.
- Identify differences in basic configurations of dc machines working both as generators and motors.
- Select motors for some special applications.

3. Required Materials

(a) Text (Recommended):

Circuit Analysis with Devices: Theory and Practice
Robins and Miller ISBN 1-4018-7984-5

(b) Other (Recommended)

Foundations of Electronics, Circuits and Devices 3rd Edition
Russell L. Meade ISBN 0-7668-0427-5

Introduction to Electric Circuit, 9th Edition
Herbert W Jackson ISBN 9-780195-438130

Access to a PC, online resources.

(c) Course materials from D2L site TBD

4. Course Content and Schedule (Subject to change)

1.	**Introduction**	**8 hours**
1.1	Electrical symbols and schematic diagrams	
1.2	Voltage, current, resistance and Ohms Law	
1.3	Series resistors, voltage divider rule	
1.4	Parallel resistors, current divider rule	
1.5	Power and energy, energy conversion	
1.6	Maximum power transfer theorem	
1.7	Superposition and Thevenin's theorem	
1.8	DC Measuring instruments and loading	
2.	**Reactive components**	**9 hours**
2.1	DC Capacitors and RC	
2.2	AC Capacitors, C reactance and complex numbers	
2.3	DC Inductors and RL	
2.4	AC Inductors, L reactance and complex RL	
2.5	Complex RLC, series resonance	
2.6	Complex RLC, parallel resonance	
2.7	AC measurements, oscilloscope, phasor diagram	
2.8	True, reactive and apparent power	
2.9	Power factor and PF correction	
3.	**Electromagnetism**	**5 hours**
3.1	Electromagnetism introduction	
3.2	Ideal transformer	
3.3	Transformer ratios, reflected Z	
3.4	Transformer losses, power, selection, rectification	
4.	**DC motors and generators**	**4 hours**
4.1	Electromagnetics review	
4.2	Electric machine physical construction	
4.3	Series, shunt and compound wiring	
4.4	DC motor controller	
5.	**AC motors and generators**	**11 hours**
5.1	Three-phase sine and graphical representations	
5.2	Three-phase induction motors	
5.3	Y-delta, primary R and autotransformer starting	
5.4	Three-phase synchronous motors	
5.5	Brushless DC and stepper motors	
5.6	VFD sine signal generation	
5.7	VFD specifications, V/Hz and FOC	
5.8	Single-phase motors	
5.9	Synchronous generators	
5.10	Induction generators	
5.11	Three-phase power distribution	
Tests and review		7 hours
Total		**44 hours**

Lab Topics (Subject to change)

1	Intro to lab and equipment
2	Ohm's Law and Series Resistive Circuits
3	Parallel and Combination Resistors
4	Series & parallel resistors
5	Max power, Thevenin theorem
6	Series/parallel caps, RC
7	RL, stored energy
8	AC RC and RLC filter
9	Transformers
10	Rectifiers
11	DC motors
12	DC & AC Generators
13	AC synchronous motor
14	AC induction motor starting

5. Basis of Student Assessment (Weighting)

Assignments:		20%
Exams:	Mid-term(s):	30%
	Final:	30%
Labs:		20%

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

A. GRADING SYSTEMS *http://www.camosun.bc.ca/policies/policies.php*

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://www.camosun.bc.ca/policies/E-1.5.pdf 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.