CAMOSUN COLLEGE
Electronics & Computer Engineering Technology

ECET 120 Renewable Energy Systems

This course provides the foundation for the analysis and design of renewable energy (RE) systems including: solar PV, wind, solar thermal, hydroelectric, tidal, wave, geothermal, bioenergy and fuel cell technologies. The course examines energy generation from renewable sources as well as energy storage systems.

Instructor Information

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Learning Outcomes

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

- describe characteristics of renewable energy (RE) resources
- explain the principles of operation of RE systems, including solar photovoltaic (PV), hydrogen fuel cells, wind, solar thermal, hydroelectric, tidal, wave, geothermal and bioenergy
- explain the benefits of RE systems vs conventional power generation
- analyze the operation and efficiency of RE systems
- calculate the energy inputs, outputs and efficiency of RE systems
- explain differences between AC and DC power generation/distribution systems
- specify RE system based on stated energy supply requirements
- describe characteristics of energy storage systems
- analyze and give examples of RE case studies
- assess challenges of RE technologies and integration
- demonstrate competence in RE system design and operation in the laboratory

Materials

Optional Text:	Renewable Energy Systems, Buchla, Kissell & Floyd (references from this text are provided in the table below)
Optional Text:	Renewable Energy: Power for a sustainable future, ed. Boyle (references from this text are provided in [ ] in the table below)
Website	D2L website for ECET 120

Assessment

Class presentation	10%
Tests	30%
Labs	20%
Final exam	40%

Dates

Problem set 1 solutions posted	(week 4)	Monday 27 January 2020
Test 1	(week 5)	Wednesday 5 February 2020
Problem set 2 solutions posted	(week 8)	Monday 24 February 2020
Test 2	(week 9)	Wednesday 4 March 2020
Problem set 3 solutions posted	(week 12)	Monday 23 March 2020
Test 3	(week 13)	Wednesday 1 April 2020
Final exam		14 - 22 April 2020

Course Content

Topic	Reference	Estimated Time (hours)
Introduction	Section 1.1 Sections 6.5-6.7 Sections 13.1-13.2 [Chapter 1]	2
Solar photovoltaic	Section 1.3 Chapter 3 Sections 4.1-4.3 Chapter 5 Section 6.3 [Chapter 3]	7
Hydrogen fuel cells	Chapter 12 [Section 10.6]	6
Wind	Section 1.4 Chapter 7 Chapter 8 Sections 13.3-13.4 [Chapter 7]	7
Solar thermal	Sections 4.4-4.5 Chapter 5 Section 10.4 [Chapter 2]	4
Energy storage	Sections 6.1-6.2 [Chapter 10]	5
Hydroelectricity	Section 1.6 Sections 11.1-11.3 [Chapter 5]	1*

Tidal	Section 11.4 [Chapter 6]	1*
Wave	Section 11.5 [Chapter 8]	1*
Geothermal	Section 1.5 Sections 10.1-10.3 Section 10.5 [Chapter 9]	1*
Bioenergy	Section 1.7 Chapter 9 [Chapter 4]	1*
Nuclear	Section 1.2 [Section 1.1]	0.5
Integration and the grid	Chapter 14 [Chapter 10]	1
Conservation	[Section 10.7]	0.5
Review, tests and holidays		9
Total (no classes during reading break)		42
* These topics will be covered by class presentations, during lab time.		

Labs

Lab attendance is mandatory. Some labs are checked off within the lab period; some require reports. 10% per day will be deducted for lab reports that are handed in late. There are no labs during reading week.

Activity	**Time (weeks)**
1 Generation of DC and AC Voltage and Inverters	1
2 Sign up for presentation and meet your group. Photovoltaic Solar Energy: IV Characteristic and Dynamic Resistance	1
3 Photovoltaic Solar Energy: Panel Efficiency	1
4 Photovoltaic Solar Energy: Camosun College Solar Panels	1
5 Hydrogen Fuel Cell: Electrolysis of Water	1
6 Hydrogen Fuel Cell: Performance	1
7 Wind Energy: Generated Voltage and Power	1
8 Wind Energy: Tip Speed Ratio, Blade Pitch and Gearing	1
9 Solar Thermal Water Heating	1
10 Battery Charging and Discharging	1
11 Class Presentations (hydro, tidal, wave)	1
12 Class Presentations (geothermal, bioenergy)	1
13 Available for exam review	1