School of Renewable Resources
Certificate in Renewable Energy

RNW 105
Green Electricity: Small Hydro, Wind, and Solar Photovoltaic Systems

Course Outline
Fall, 2009

Instructor
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Hours/Week & Schedule:

Lecture: Noon-4:00pm Thursday
Lab: 8:00am-Noon Friday
Seminar: 11:00am-Noon Thursday

Instructor Hours: Posted on Office Door

Credit: 3

Course Description:

Green Electricity: Small Hydro, Wind, and Solar Photovoltaic Systems (RNW 105) introduces renewable electric power generation, how to assess a site for renewable power generation, and system components. The cost and performance of different technologies are compared. Off-grid, grid-tie and hybrid renewable power generating configurations are considered.

Prerequisites:

English 12 or equivalent, Principles of Math 11 with a C+ or Math Applications 11 with a B are required for program admission, and successful completion of all courses in the first semester or permission of the Chair of the School of Renewable Resources.

Transfer Credit:

Selkirk College has negotiated articulation agreements with several universities whereby graduates from the School of Renewable Resources are able to receive either two full years of credit (block transfer) towards the completion of a specific degree or some other amount of credit towards a university degree or other post-secondary program. Please contact a Selkirk College counsellor or the Chair of the School of Renewable Resources for more information regarding transfer credit. Past transfer credit is no assurance of credit that may currently be obtained. For students wishing to obtain transfer credit, retain this course outline, completed and graded assignments and academic transcripts. Use these documents to support requests for transfer credit.

Course Outcomes:

This course is an integral part of the Certificate in Renewable Energy program: a post-secondary, college-level, technology program. Renewable Energy Certificate program graduates who complete this course will be able to demonstrate knowledge or skills listed at a level consistent with expectations for entry-level renewable energy technicians.

Theoretical Outcomes:

Students who complete this course will be able to:

1. define small hydro power generation and estimate theoretical power potential for a site.

2. identify system components in a small hydro power system and how they interact.

3. complete basic design exercises for scenarios like high head and low flow, high seasonal flux in flow, piping down rugged terrain, system controls, and grid-tie considerations.

4. define solar photovoltaic power generation, and estimate the size of a system, system components and their interaction.

5. complete basic design exercises considering various light regimes, system loads, load management, battery storage, grid-tie, and net-metering.

6. define electric power generation using wind energy and estimate theoretical power generation for a site.

7. estimate wind energy available at a particular site and the technical and economic feasibility of using wind energy for different applications; review geographic meteorologic factors limiting wind energy.

8. compare system components in relation to cost, installation difficulty, reliability and maintenance.

Skills Outcomes:

Students who complete this course will be able to:

1. identify and explain basic design considerations for small hydro, solar photovoltaic, and wind power projects.

2. list the components needed and how they interact for small hydro, solar photovoltaic, and wind power systems.

3. explain system controls.

4. complete basic design exercises for small hydro, solar photovoltaic, and wind power systems.

Textbooks / Supplemental Materials:

Required Texts:

TBA

Required Supplies:

- notebook
- pen or pencil
- clipboard or field notebook

Evaluation:

Presentations (3 @ 10%)	30%
Midterm (3 @ 10%)	30%
Final Exam	30%
Professionalism (punctual, regular attendance, prepared, equipped and contributing to personal and team success)	10%
Total	100%

Grading:

A+	95% to 100%	= 4.00	B+	80% to 84%	= 3.33	C+	65% to 69%	= 2.33
A	90% to 94%	= 4.00	B	75% to 79%	= 3.00	C	60% to 64%	= 2.00
A-	85% to 89%	= 3.67	B-	70% to 74%	= 2.67	C-	55% to 59%	= 1.67
						P	50% to 54%	= 1.00
						F	Less than 50%	= 0.00
						DNW	Did not withdraw	= 0.00

Evaluation Methods:

Professionalism will be evaluated on the basis of punctuality, regular attendance, preparation, completion of assignments as scheduled, courtesy during classes and other educational activities, helping classmates to learn course material, respect for college property, public and private property visited while on field trips. These are qualities that employers seek in renewable energy technicians and technologists and are therefore behaviors that are encouraged and entitled to recognition. These qualities are not easily measured and require discretion in their evaluation on the part of the instructor.

Additional Relevant Information/Course Expectations:

Attendance and Late Assignments:

Students are expected to make every reasonable effort not to miss examinations and to submit assignments on time. Compassionate excuses will be considered only if documented. Students must advise the instructor *before* assignment deadlines or examinations if they are unable to meet the schedule. Otherwise *late assignments will not be accepted for grading nor will examinations be rescheduled.*

The academic policies of the School of Renewable Resources and Selkirk College will be observed. For more information on these policies refer to the School of Renewable Resources Academic Policies and the Selkirk College Calendar at http://ecampus.selkirk.ca/ or visit the Certificate in Renewable Energy program web site at http://selkirk.ca/programs/rr/academicprograms/renewableenergy/

Course Schedule:[1]

week	Date (week ending)	Topic or activity	Assignment	Deadlines
1	Oct 29th 2009	Lecture – Wind Power Theory	Readings and work sheet	Presentation of Wind Power case study
1	Oct 30th 2009	Lecture – Wind Power Dismantle wind turbine	Lab	
2	Nov 5th 2009	Wind Power Theory	Readings and work sheet	
2	Nov 6th 2009	Wind Power Tour Set up Wind Turbine	Study for Wind Power Midterm	
3	Nov 12th 2009	Wind Power Exam Lecture – Hydro	Readings and work sheets Hydro Presentation Classroom/Lab	Midterm – Wind Power
3	Nov 13th 2009	Make a 4" Pelton Wheel penstock, reheostat an alternator into a system	Readings and work sheet	
4	Nov 19th 2009	Hydro Power Theory	Readings and work sheet	Hydro power case study presentation
4	Nov 20th 2009	Guest Speaker: Harry R. Safety Authority Electrical Inspector Wind Hydro tour	Study for Hydro Midterm	
5	Nov 26th 2009	Intro Solar Power	Readings and work sheet Solar presentation	Midterm – Hydro
5	Nov 27th 2009	Assemble wind turbine components with solar PV system	Work Sheets / Lab	Solar Case Study Presentation

[1] Course schedule is subject to change without notice.

week	Date (week ending)	Topic or activity	Assignment	Deadlines
6	Dec 3rd 2009	Tour – Dean MacKinnon's Solar PV	Readings and work sheet	
6	Dec 4th 2009	Solar PV Theory	Work Sheets and Lab	Midterm – Solar
7	Dec 10th 2009	Review for final exam	Work Sheets and Reading	
7	Dec 11th 2009	Final Exam		Final Exam

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