University of Manitoba

Department of Electrical & Computer Engineering
Graduate Course Outline

Fall 2021

ECE 7880 – Distributed Energy Generation

COURSE DESCRIPTION:

This course provides detailed introduction to the availability and characteristics of renewable energy resources, technologies used for electricity generation and energy storage, and methods used for evaluating technical and economic benefits. The course also introduces the issues involving grid integration of large-scale and distributed renewable electricity generation, and techniques used to analyze these issues.

COURSE OBJECTIVE:

This course is intended to provide knowledge of the benefits of renewable energy generation, availability of renewable energy resources, renewable electricity generation technologies, issues related to grid interconnection, and methods of analyzing the technical and economic feasibility of renewable energy systems.

PRE-REQUISITES:

ECE 4300 Energy Systems I or equivalent course.

CONTACT HOURS:

3-hours per week

COURSE CONTENT:

The following topics will be discussed:

- Introduction to the renewable energy: Rationale for renewable energy; Distributed versus central generation; Technical, economic and environmental benefits; Barriers and policy issues;
- Renewable energy resources modelling and electricity generation technologies: Small hydro, Wind, and Solar PV power generation; Biomass/Biogas;
- Planning of renewable energy projects: Load curves and aggregate behavior; Assessment of reliability impacts; Reliability and contingency criteria for planning;
- Economics evaluation of renewable energy projects: Costs; Economic evaluation; Pricing;
- Grid integration of distributed and large-scale renewable electricity generation: Protection and control issues; Need for energy storage and technologies; Interconnection standards (IEEE Std. 1547) and Grid codes;
- Renewable electricity generation case studies;

Additional advanced research topics as determined by the instructor.

HOMEWORK:

Homework will consist of assignments and a term project.

TEXTBOOK:

Renewable and Efficient Electric Power Systems – Gilbert M. Masters, 2nd Edition, Wiley-IEEE Press, Hoboken, New Jersey, USA, 2013 and Material provided by the instructor

Recommended references

Distributed Generation – Nick Jenkins, Janaka B Ekanayake, and Goran Strbac, IET Renewable Energy Series – 1, IET, London, UK, 2010

Distributed Power Generation: Planning and Evaluation – H. Lee Willis and Walter G. Scott, Power Engineering Series – 10, Marcel Dekker Inc., New York, USA, 2000

GRADE ANNOUNCEMENTS:

Grades for this course will be announced by the end of February 2022

EVALUATION:

Your final course grade is determined by your performance in the components list below in the Evaluation Table (seminar, assignments, project, mid-term, and a final examination. Students must receive a minimum of 50% on the final examination and must complete and pass all components in the course in order to be eligible to receive a passing grade.

Each component is weighted as follows:

COMPONENT	NO	VALUE %	TOTAL VALUE	DETAILS / ADDITIONAL INFO
Seminars				
Assignments	4-5	10-8%	40	4 or 5 assignments
Project	1	15%	15	
Mid-Term Exam				
Final Examination	1	45%	45	
TOTAL			100	

GRADE SCALE:

The following is a general guideline only.

LETTER	MARK	LETTER	MARK	LETTER	MARK	LETTER	MARK
A+	95-100	B+	80-84	C+	65-69	D	45-54
A	85-94	B	70-79	C	55-64	F	<45

INSTRUCTOR INFO:

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Office Hours:..... By appointment

VOLUNTARY WITHDRAW:

TBD

REQUIREMENTS/REGULATIONS

Student Responsibilities: It is the responsibility of each student to contact the instructor if he/she is uncertain about his/her standing in the course and his/her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with, among others, incomplete term work, deferred examinations, attendance and withdrawal, etc..

Lectures: Attendance at lectures is essential for successful completion of this course. Students must satisfy each evaluation component in the course.

ACADEMIC INTEGRITY

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are reminded that plagiarism* or any other form of cheating is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university) regardless of media

- examinations
- assignments
- laboratory reports
- term exams

A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty

Please refer any questions regarding Academic Integrity to your course instructor.

***Plagiarism:** to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source