ECE 4310 – Electrical Energy Systems 2  
Winter 2020

Course Objectives
To build on the basic concepts learned and skills gained in the prerequisite course ECE 4300 Energy Systems 1, and to understand planning and operational aspects of power systems.

Course Content
The following topics will be covered:

- Controlling active power and reactive power at the generating station through governor control and excitation control.
- Allocation of generation among the generating units in the most economical manner.
- Commitment of generating units in the most economical manner.
- Concepts of over-current, differential, and distance protection.
- Concepts of power system reliability analysis.

Textbook
No prescribed textbook.

Learning Outcomes
1. To be able to develop simulation models of Load Frequency Control and Excitation Control systems and evaluate the performance.
2. To be able to analyze the stability of excitation systems.
3. Calculate reliability Indices of generation systems.
4. Calculate the output of generating units to minimize the cost of operation.
5. Design of overcurrent protection for a radial distribution feeder.

Expected Competency Levels

<table>
<thead>
<tr>
<th>Outcome</th>
<th>KB</th>
<th>PA</th>
<th>IN</th>
<th>DE</th>
<th>ET</th>
<th>IT</th>
<th>CS</th>
<th>PR</th>
<th>IE</th>
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CEAB Graduate Attributes Assessed

KB.4 – Recalls and defines, and/or comprehends and applies information, first principles, and concept in specialized engineering science.

PA.4 – Evaluates a solution to a complex engineering problem.
Evaluation

The final course grade is determined by the student’s performance on assignments, in laboratories, and on examinations. Students must complete all the laboratories in order to be eligible to receive a passing grade.

<table>
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<tr>
<th>Component</th>
<th>Value (%)</th>
<th>Method of Feedback</th>
<th>Learning Outcomes Evaluated</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>10</td>
<td>F, S</td>
<td>1, 2, 3, 4, 5</td>
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<tr>
<td>Laboratories</td>
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<td>F, S</td>
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<td>F, S</td>
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<td>Final Examination</td>
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<td>S</td>
<td>1, 2, 3, 4, 5</td>
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* Method of Feedback: F - Formative (written comments and/or oral discussion), S - summative (numerical grade)

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 on Academic Integrity, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty.

Requirements/Regulations

- Attendance at lectures and laboratories is essential for successful completion of this course. Students must satisfy each evaluation component in the course to receive a final grade.
- It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with the University’s General Academic Regulations, as well as Section 3 of the Faculty of Engineering Academic Regulations dealing with incomplete term work, deferred examinations, attendance and withdrawal.
- No programmable devices or systems (such as calculators, PDAs, iPods, iPads, cell phones, smart watches, wireless communication or data storage devices) are allowed in examinations unless approved by the course instructor.
- Students should be aware that they have access to an extensive range of resources and support organizations. These include Academic Resources, Counselling, Advocacy and Accessibility Offices as well as documentation of key University policies e.g. Academic Integrity, Respectful Behaviour, Examinations and related matters.

Retention of Student Work

Students are advised that copies of their work submitted in completing course requirements (i.e. assignments, laboratory reports, project reports, test papers, examination papers, etc.) may be retained by the instructor and/or the department for the purpose of student assessment and grading, and to support the ongoing accreditation of each Engineering program. This material shall be handled in accordance with the University’s Intellectual Property Policy and the protection of privacy provisions of The Freedom of Information and Protection of Privacy Act (Manitoba). Students who do not wish to have their work retained must inform the Head of Department, in writing, at their earliest opportunity.

Accreditation Details

Accreditation Units
- Mathematics: 0%
- Natural Science: 0%
- Complementary Studies: 0%
- Engineering Science: 100%
- Engineering Design: 0%

Attributes
- KB: A knowledge base for engineering
- PA: Problem analysis
- IN: Investigation
- DE: Design
- ET: Use of engineering tools
- IT: Individual and team work
- CS: Communication skills
- PR: Professionalism
- IE: Impact of engineering on society/environment
- EE: Ethics and equity
- EP: Economics and project management
- LL: Life-long learning

Competency Levels
1 - Knowledge (Able to recall information)
2 - Comprehension (Ability rephrase information)
3 - Application (Ability to apply knowledge in a new situation)
4 - Analysis (Able to break problem into its components and establish relationships.)
5 - Synthesis (Able to combine separate elements into a whole)
6 - Evaluation (Able to judge the worth of something)