



## Course Outline

Course Name: Power Systems 2 (ELEC 300)

Academic Period: 2023 - 2024

**Faculty:**

**Faculty Availability:**

**Associate Dean:**

Shaun Ghafari  
shaun.ghafari@humber.ca

**Schedule Type Code:**

## Land Acknowledgement

Humber College is located within the traditional and treaty lands of the Mississaugas of the Credit. Known as Adoobiigok [A-doe-bee-goke], the "Place of the Alders" in Michi Saagiig [Mi-Chee Saw-Geeg] language, the region is uniquely situated along Humber River Watershed, which historically provided an integral connection for Anishinaabe [Ah-nish-nah-bay], Haudenosaunee [Hoeden-no-shownee], and Wendat [Wine-Dot] peoples between the Ontario Lakeshore and the Lake Simcoe/Georgian Bay regions. Now home to people of numerous nations, Adoobiigok continues to provide a vital source of interconnection for all.

## Equity, Diversity and Inclusion Statement

Humber College and the University of Guelph-Humber (Humber) are leaders in providing a learning, working and living environment that recognizes and values equity, diversity and inclusion in all its programs and services. Humber commits to reflect the diversity of the communities the College serves. Students, faculty, support and administrative staff feel a sense of belonging and have opportunities to be their authentic selves.

<b>Faculty or Department</b>	Faculty of Applied Sciences & Technology
<b>Course Name:</b>	Power Systems 2 (ELEC 300)
<b>Pre-Requisites</b>	<a href="#">ELEC 211</a>
<b>Co-Requisites</b>	none
<b>Equates</b>	none
<b>Restrictions</b>	none
<b>Credit Value</b>	6
<b>Total Course Hours</b>	84

**Developed By:****Prepared By:****Approved by:**

Shaun Ghafari



## Humber Learning Outcomes (HLOs) in this course.

The HLOs are a cross-institutional learning outcomes strategy aimed at equipping Humber graduates with the employability skills, mindsets, and values they need to succeed in the future of work. To explore all the HLOs, please consult the [Humber Learning Outcomes framework](#).



Systems Thinking



Critical Thinking



Communication



Professionalism



Strategic Problem-Solving

## Course Description

This course covers the modelling of overhead and underground conductors and cables in the formation of transmission lines. Representation of transmission lines as a two part network and its operation under various conditions. Representation of short, medium and long transmission lines and power flow through transmission lines. The major problems for a power system of: optimum economic operation, system stability, system protection, system quality and power factor correction are studied. The course also covers analysis of symmetrical and unsymmetrical faults using symmetrical components.

## Course Rationale

Power System course is very important for students getting into Power Generation, Transmission and Distribution Industry. Students get fundamental knowledge of Power Systems including conductor sizing and performance calculations. The course contents on fault analysis, connects to the Power system distribution, protection and control course.

## Course Learning Method(s)

- Group or Team Work
- Lecture
- Inquiry Based Learning

## Learning Outcomes

- Explain the transmission lines modeling using R, XL and Xc parameters
- Demonstrate the ability to do mathematical representation of transmission lines as a two port networks, multiport networks and understand their operation under various conditions
- Describe ABCD constants for calculating the performance of transmission lines
- Conduct economic analysis of the operation of power systems under various constraints
- Describe the symmetrical components theory and apply this theory to perform conventional fault analysis on power systems
- Perform 3-Phase balanced fault studies using direct and Indirect methods
- Conduct Single - Phase to ground fault, Double line to ground fault and Phase to Phase fault studies using symmetrical Components
- Perform Power System Stability Analysis using numerical and graphical methods under various fault conditions.
- Conduct experiments on three-phase transmission lines and prepare reports by analyzing data.

## Assessment Weighting

Assessment	Weight
Report	
Lab Reports	10%
Practical Exam	
Lab Test	10%
Demonstration	
Performing a lab experiment	10%
Final Exam	
Final Exam	35%
Midterm Exam	
Mid Term Exam	35%
<b>Total</b>	<b>100%</b>

## Modules of Study

Module	Course Learning Outcomes	Resources	Assessments
Transmission line design considerations and parameters	<ul style="list-style-type: none"> <li>Explain the transmission lines modeling using R, XL and Xc parameters</li> <li>Conduct experiments on three-phase transmission lines and prepare reports by analyzing data.</li> </ul>	<p><i>Chapter # 4</i></p> <p>Gungor, Behic R., <i>Power Systems</i>, Harcourt Brace Jovanovich Inc., 1988</p>	<ul style="list-style-type: none"> <li>Mid Term Exam</li> <li>Performing a lab experiment</li> <li>Lab Test</li> <li>Lab Reports</li> </ul>
Short length Transmission line analysis	<ul style="list-style-type: none"> <li>Demonstrate the ability to do mathematical representation of transmission lines as a two port networks, multiport networks and understand their operation under various conditions</li> <li>Conduct experiments on three-phase transmission lines and prepare reports by analyzing data.</li> </ul>	<p><i>Chapter # 4</i></p> <p>Gungor, Behic R., <i>Power Systems</i>, Harcourt Brace Jovanovich Inc., 1988</p>	<ul style="list-style-type: none"> <li>Mid Term Exam</li> <li>Performing a lab experiment</li> <li>Lab Test</li> <li>Lab Reports</li> </ul>

Module	Course Learning Outcomes	Resources	Assessments
Medium length Transmission line analysis	<ul style="list-style-type: none"> <li>Demonstrate the ability to do mathematical representation of transmission lines as a two port networks, multiport networks and understand their operation under various conditions</li> <li>Describe ABCD constants for calculating the performance of transmission lines</li> <li>Conduct experiments on three-phase transmission lines and prepare reports by analyzing data.</li> </ul>	<p><i>Chapter # 4</i></p> <p>Gungor, Behic R., <i>Power Systems</i>, Harcourt Brace Jovanovich Inc., 1988</p>	<ul style="list-style-type: none"> <li>Mid Term Exam</li> <li>Performing a lab experiment</li> <li>Lab Test</li> <li>Lab Reports</li> </ul>
Economic Operation	<ul style="list-style-type: none"> <li>Conduct economic analysis of the operation of power systems under various constraints</li> </ul>	<p><i>Chapter # 7</i></p> <p>Gungor, Behic R., <i>Power Systems</i>, Harcourt Brace Jovanovich Inc., 1988</p>	<ul style="list-style-type: none"> <li>Mid Term Exam</li> </ul>
Symmetrical Components of Three-Phase Systems	<ul style="list-style-type: none"> <li>Describe the symmetrical components theory and apply this theory to perform conventional fault analysis on power systems</li> </ul>	<p><i>Chapter # 8</i></p> <p>Gungor, Behic R., <i>Power Systems</i>, Harcourt Brace Jovanovich Inc., 1988</p>	<ul style="list-style-type: none"> <li>Final Exam</li> </ul>
Symmetrical Component Models and Networks	<ul style="list-style-type: none"> <li>Describe the symmetrical components theory and apply this theory to perform conventional fault analysis on power systems</li> <li>Perform 3-Phase balanced fault studies using direct and Indirect methods</li> </ul>	<p><i>Chapter # 10</i></p> <p>Gungor, Behic R., <i>Power Systems</i>, Harcourt Brace Jovanovich Inc., 1988</p>	<ul style="list-style-type: none"> <li>Final Exam</li> </ul>
Unsymmetrical Fault analysis using symmetrical component networks	<ul style="list-style-type: none"> <li>Conduct Single - Phase to ground fault, Double line to ground fault and Phase to Phase fault studies using symmetrical Components</li> </ul>	<p><i>Chapter # 10</i></p> <p>Gungor, Behic R., <i>Power Systems</i>, Harcourt Brace Jovanovich Inc., 1988</p>	<ul style="list-style-type: none"> <li>Final Exam</li> </ul>

Module	Course Learning Outcomes	Resources	Assessments
Power System Stability	<ul style="list-style-type: none"> <li>Perform Power System Stability Analysis using numerical and graphical methods under various fault conditions.</li> </ul>	<p><i>Chapter # 11</i></p> <p>Gungor, Behic R., <i>Power Systems</i>, Harcourt Brace Jovanovich Inc., 1988</p>	<ul style="list-style-type: none"> <li>Final Exam</li> </ul>

## Required Resources

Gungor, Behic R., *Power Systems*, Harcourt Brace Jovanovich Inc., 1988

ISBN #: 0155707612

## Supplemental Resources

Lab Manual for Power System 2

## Essential Skills

Section	Skills	Measurement	Details
Communication	<ul style="list-style-type: none"> <li>Reading</li> <li>Writing</li> <li>Speaking</li> <li>Listening</li> <li>Presenting</li> <li>Visual Literacy</li> </ul>	Reinforce and measure	<ul style="list-style-type: none"> <li>Preparing lab reports after completing the experiment. Completing the mid-term and final exam tests. Taking part in in-class problem solving activities during the tutorial classes.</li> <li>Lab Reports Mid Term Test Final Exam Tutorial class - in class activities</li> </ul>
Numeracy	<ul style="list-style-type: none"> <li>Understanding and applying mathematical concepts and reasoning</li> <li>Analyzing and using numerical data</li> <li>Conceptualizing</li> </ul>	Reinforce and measure	<ul style="list-style-type: none"> <li>The course presents analyzing the transmission line configurations and apply mathematical expressions for performance analysis. Analyze experimental observations and prepare lab reports.</li> <li>Lab Reports Mid Term Test Final Exam Tutorial class - in class activities</li> </ul>
Critical Thinking and Problem-Solving	<ul style="list-style-type: none"> <li>Analysing</li> <li>Synthesizing</li> <li>Evaluating</li> <li>Decision-Making</li> <li>Creative and Innovative Thinking</li> </ul>	Reinforce and measure	<ul style="list-style-type: none"> <li>Students will use their ability to use presented contents, information, and data to effectively solve problems. Students will get opportunities, inside the class, to share their thoughts and answers.</li> <li>Lab Reports Mid Term Test Final Exam Tutorial class - in class activities</li> </ul>

Section	Skills	Measurement	Details
Information Management	<ul style="list-style-type: none"> <li>Gathering and managing information</li> <li>Selecting and using appropriate tools and technology for a task or project</li> <li>Computer literacy</li> <li>Internet skills</li> </ul>	Reinforce and measure	<ul style="list-style-type: none"> <li>Students will practice their ability of acquisition of information from the lectures and labs. Students will manage the information in the form of their class notes and experimental observations. Students will use internet skills and computer platform to store and access the information at a later date.</li> <li>Lab Reports Mid Term Test Final Exam Tutorial class - in class activities</li> </ul>
Interpersonal Skills	<ul style="list-style-type: none"> <li>Teamwork</li> <li>Relationship management</li> <li>Conflict resolution</li> </ul>	Reinforce and measure	<ul style="list-style-type: none"> <li>Students will have an opportunity to practice their skills of teamwork while working on the lab experiments and while solving problems in their tutorial classes.</li> <li>Lab Experiments - in class activity Lab Reports Mid Term Test Final Exam Tutorial class - in class activities</li> </ul>
Personal Skills	<ul style="list-style-type: none"> <li>Managing self</li> <li>Managing change and being flexible and adaptable</li> <li>Engaging in reflective practice</li> <li>Demonstrating personal responsibility</li> </ul>	Reinforce and measure	<ul style="list-style-type: none"> <li>Students will practice personal skills by demonstrating an acceptable level of professionalism by being on time for all classes, participating in all class activities (individual and group), showing respect for the opinion of others and completing and submitting all assignments by the due dates in the prescribed manner</li> <li>Lab Experiments - in class activity Lab Reports Mid Term Test Final Exam Tutorial class - in class activities</li> </ul>

## Prior Learning Assessment & Recognition (PLAR)

Prior Learning Assessment and Recognition (PLAR) is the formal evaluation and credit-granting process whereby candidates may obtain credits for prior learning. Prior learning includes the knowledge competencies and skills acquired, in both formal and informal ways, outside of post-secondary education. Candidates may have their knowledge, skills and competencies evaluated against the learning outcomes as defined in the course outline. Please review the [Assessment Methods Glossary](#) for more information on the Learning Portfolio assessment methods identified below.

The method(s) that are used to assess prior learning for this course may include:

- Challenge Exam (results recorded as a % grade and added to student's CGPA)
- Learning Portfolio (results reflected as SAT and not added to student's CGPA)
- Current resume
- LinkedIn profile
- Collection of work
- Skills Test
- Interview
- Oral exam

Please contact the Program Coordinator for more details.

## Academic Regulations

It is the student's responsibility to be aware of the College Academic Regulations. The Academic Regulations apply to all applicants to Humber and all current students enrolled in any program or course offered by Humber, in any location. Information about academic appeals is found in the [Academic Regulations](#).

## Anti-Discrimination Statement

At Humber College, all forms of discrimination and harassment are prohibited. Students and employees have the right to study, live and work in an environment that is free from discrimination and harassment. If you need assistance on concerns related to discrimination and harassment, please contact the [Centre for Human Rights, Equity and Inclusion](#) or the [Office of Student Conduct](#).

## Accessible Learning Services

Humber strives to create a welcoming environment for all students where equity, diversity and inclusion are paramount. Accessible Learning Services facilitates equal access for students with disabilities by coordinating academic accommodations and services. Staff in Accessible Learning Services are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. If you require academic accommodations, contact:

[Accessible Learning Services](#)

North Campus: (416) 675-6622 X5090

Lakeshore Campus: (416) 675-6622 X3331

## Academic Integrity

Academic integrity is essentially honesty in all academic endeavors. Academic integrity requires that students avoid all forms of academic misconduct or dishonesty, including plagiarism, cheating on tests or exams or any misrepresentation of academic accomplishment.

## Disclaimer

While every effort is made by the professor/faculty to cover all material listed in the outline, the order, content, and/or evaluation may change in the event of special circumstances (e.g. time constraints due to inclement weather, sickness, college closure, technology/equipment problems or changes, etc.). In any such case, students will be given appropriate notification in writing, with approval from the Dean (or designate) of the School.

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