HUMBER

Course Outline

Course Name: Power Systems 1 (ELEC 211)

Academic Period: 2022 - 2023

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.

Faculty or Department	Faculty of Applied Sciences & Technology
Course Name:	Power Systems 1 (ELEC 211)
Pre-Requisites	none
Co-Requisites	none
Equates	none
Restrictions	none
Credit Value	6
Total Course Hours	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.

Course Description

N/A

Course Rationale

This course aims to develop student knowledge and understanding of three-phase systems and single phase rotating electrical machinery including transformers and motors. Students would apply their mathematical skills and knowledge of AC circuits to analyze and solve three-phase systems and single-phase transformer circuits. The course will prepare students for studying power distribution fundamentals, three-phase transformers in electrical circuit analysis and power systems 2.

Course Learning Method(s)

- Lecture
- Inquiry Based Learning

Learning Outcomes

- Describe the principle of operation of single phase transformers using ideal transformer concept, transformation ratio, transformer polarity, ratings, transformer equation, and the practical transformer.
- Develop transformer equivalent circuits to understand reflected or referred impedance, to calculate percent voltage regulation and to calculate efficiency.
- Describe the operation of the autotransformer, potential and current transformers
- Identify and describe the functions of major components of a power transformer
- Conceptualize the principle of operation, performance characteristics and starting methods of the single-phase motors including Split phase, Capacitor Start and Universal and explore their applications
- Explain and analyze three-phase balanced circuits using wiring diagrams and vector analysis
- Explain and analyze by way of phasor diagrams three-phase power measurements, using 1-wattmeter, 2-wattmeter, and 3-wattmeter methods
- Analyze one line diagram to represent power system and perform calculations in p.u. quantities
- Perform experiments on single phase transformers and three-phase circuits and prepare reports by analyzing data.

Assessment Weighting

Assessment	Weight
Practical Exam	
Lab Test	10%
Simulation	
Performing an experiment	10%

Assessment	Weight
Report	
Lab Reports	10%
Final Exam	
Final Exam	35%
Quiz	
Quiz	10%
Midterm Exam	
Mid Term Exam	25%
Total	**100%**

Modules of Study

Module	Course Learning Outcomes	Resources	Assessments
Single-Phase transformers	• Describe the principle of operation of single phase transformers using ideal transformer concept, transformation ratio, transformer polarity, ratings, transformer equation, and the practical transformer. • Perform experiments on single phase transformers and three-phase circuits and prepare reports by analyzing data.	1. Electrical Machines, Drives and Power Systems by Theodore Wildi (Chapter 9, 10) 2. Lab Manual	• Lab Reports • Lab Test • Performing an experiment • Mid Term Exam • Quiz
Single-Phase transformer equivalent circuits	• Develop transformer equivalent circuits to understand reflected or referred impedance, to calculate percent voltage regulation and to calculate efficiency. • Perform experiments on single phase transformers and three-phase circuits and prepare reports by analyzing data.	1. Electrical Machines, Drives and Power Systems by Theodore Wildi (Chapter 9, 10) 2. Lab Manual	• Lab Reports • Lab Test • Performing an experiment • Mid Term Exam • Quiz
Specific transformer types	• Describe the operation of the autotransformer, potential and current transformers • Identify and describe the functions of major components of a power transformer • Perform experiments on single phase transformers and three-phase circuits and prepare reports by analyzing data.	1. Electrical Machines, Drives and Power Systems by Theodore Wildi (Chapter 11) 2. Lab Manual	• Lab Reports • Lab Test • Performing an experiment • Mid Term Exam • Quiz

Module	Course Learning Outcomes	Resources	Assessments
Single-Phase Motors	• Conceptualize the principle of operation, performance characteristics and starting methods of the single-phase motors including Split phase, Capacitor Start and Universal and explore their applications • Perform experiments on single phase transformers and three-phase circuits and prepare reports by analyzing data.	1. Electrical Machines, Drives and Power Systems by Theodore Wildi (Chapter 18) 2. Lab Manual	• Lab Reports • Lab Test • Performing an experiment • Mid Term Exam • Quiz
Three-phase Power systems	• Explain and analyze three-phase balanced circuits using wiring diagrams and vector analysis • Perform experiments on single phase transformers and three-phase circuits and prepare reports by analyzing data.	1. Electrical Machines, Drives and Power Systems by Theodore Wildi (Chapter 8) 2. Lab Manual	• Lab Reports • Lab Test • Performing an experiment • Quiz • Final Exam
Power measurement in three-phase systems	• Explain and analyze by way of phasor diagrams three-phase power measurements, using 1-wattmeter, 2-wattmeter, and 3-wattmeter methods • Perform experiments on single phase transformers and three-phase circuits and prepare reports by analyzing data.	1. Electrical Machines, Drives and Power Systems by Theodore Wildi (Chapter 8) 2. Lab Manual	• Lab Reports • Lab Test • Performing an experiment • Quiz • Final Exam
Power system representation and calculations	• Analyze one line diagram to represent power system and perform calculations in p.u. quantities • Perform experiments on single phase transformers and three-phase circuits and prepare reports by analyzing data.	1. Electrical Machines, Drives and Power Systems by Theodore Wildi (Chapter 1) 2. Lab Manual	• Lab Reports • Lab Test • Performing an experiment • Quiz • Final Exam

Required Resources

Theodore Wildi, Electrical Machines, Drives and Power Systems, Prentice-Hall, Eaglewood Cliffs, N.J., USA 07632. ISBN013082460-7, 6^{th} edition.

Behic R. Gungor, Power Systems, Can Copy Course Pack available at Humber Book Store

Supplemental Resources

Power Systems 1 Lab Manual by HUMBER Electrical Engineering Control Systems Department

Essential Skills

Section	Skills	Measurement	Details
Communication	• Reading • Writing • Speaking • Listening • Presenting • Visual Literacy	Reinforce and measure	• Students will read the lecture notes and reference material. Students will read the instructions in the lab manual to perform experiments Students will listen and visualize the presented lecture and lab material Students will write their own notes, the lab reports, and the assessment quizzes and tests Students will speak and present by asking questions and presenting their lab reports • The skill will be evaluated through performing the lab experiments, preparing the lab reports, completing the problem solving questions in the quizzes and the tests.
Numeracy	• Understanding and applying mathematical concepts and reasoning • Analyzing and using numerical data • Conceptualizing	Reinforce and measure	• Students will interpret the given information to solve numerical problems. Students will collect and interpret experimental data collected from lab experiments • The lab reports are marked based on the collected experimental data and analysis performed on it. The numerical problems solving ability will be assessed through tests
Critical Thinking and Problem-Solving	• Analysing • Synthesizing • Evaluating • Decision-Making • Creative and Innovative Thinking	Reinforce and measure	• Analyze, evaluate, and apply relevant information from a variety of sources. • Synthesize an experimental setup based on given lab instructions
Information Management	• Gathering and managing information • Selecting and using appropriate tools and technology for a task or project • Computer literacy • Internet skills	Reinforce and measure	• Students will gather data after performing an experiment on different topics in the course. Based on the lab instructions, students will select appropriate equipment to perform the experiment. Students will gather experimental data using data acquisition system. • Lab experiments are considered as in-class activity and students work will be evaluated for the completion of the lab experiment. Students will prepare a lab report including analysis on the collected data.

Section	Skills	Measurement	Details
Interpersonal Skills	• Teamwork • Relationship management • Conflict resolution • Networking	Reinforce and measure	• Students will perform lab experiments in a group. • Lab experiments and lab report.
Personal Skills	• Managing self • Managing change and being flexible and adaptable • Demonstrating personal responsibility	Reinforce and measure	• Students will attend scheduled lectures and labs. Students will complete quizzes, Mid-Term, and Final Test on a scheduled date and time. • Quizzes, Mid-Term and Final Test. Lab experiments and Lab Reports

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
- 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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