



Course Outline

Course Name: Industrial Electronics (ELEC 254)

Academic Period: 2022 - 2023

Faculty:

Faculty Availability:

Associate Dean:

Shaun Ghafari
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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:	Industrial Electronics (ELEC 254)
Pre-Requisites	none
Co-Requisites	none
Equates	none
Restrictions	none
Credit Value	3
Total Course Hours	42

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

The application of the electronic control devices is an essential part of any control-engineering project. This course will provide the students with more practical experience in the field of industrial electronics and introduction to power electronics.

Course Learning Method(s)

- Problem Based Learning (PBL)
- Collaborative Learning
- Lecture

Learning Outcomes

- Explain the functionality and use of limit switches, relays and contactors in industrial applications.
- Interpret wiring diagrams of industrial electronic circuits
- Design transistor drive circuit for electromechanical relays.
- Explain the functionality and application of operational amplifiers.
- Explain the operation of current-to-voltage and voltage-to-current converters.
- Explain techniques to reduce noise in electronics circuits.
- Explain the functionality and application of comparators and Schmitt triggers.
- Describe the principles, triggering and applications of Thyristors and Triacs.
- Explain how to amplify and process small signals from temperature and pressure sensors.

Assessment Weighting

Assessment	Weight
Quiz	10%
Demonstration	30%
Midterm Exam	30%
Final Exam	30%
Total	100%

Modules of Study

Module	Course Learning Outcomes	Resources	Assessments
Module 1: Discrete Control Input and Output Devices Topics: Limit switches, Push-Button switches, Contactors, Relaysetc.	<ul style="list-style-type: none"> Explain the functionality and use of limit switches, relays and contactors in industrial applications. Interpret wiring diagrams of industrial electronic circuits 	1. Chapter 2 (Regh & Sartori) 2. Class notes and Black board course notes	<ul style="list-style-type: none"> Midterm Exam Lab Assignment Quizzes
Module 2: Review of Solid-State Devices Topics: Diodes, zener diodes, LED's and Transistors.	<ul style="list-style-type: none"> Design transistor drive circuit for electromechanical relays. 	1. Chapter 3 (Regh & Sartori) 2. Class notes and Black board course notes	<ul style="list-style-type: none"> Midterm Exam Lab Assignment Quizzes
Module 3: Operational Amplifiers- Part 1 Topics: Inverting amplifiers, Non-inverting amplifiers and Summing amplifiers.	<ul style="list-style-type: none"> Explain the functionality and application of operational amplifiers. 	1. Chapter 4 (Regh & Sartori) 2. Class notes and Black board course notes	<ul style="list-style-type: none"> Midterm Exam Lab Assignment Quizzes
Module 4: Operational Amplifiers- Part 2 Topics: Differential and Integral amplifiers, current-to-voltage and voltage-to-current converters	<ul style="list-style-type: none"> Explain the functionality and application of operational amplifiers. Explain the operation of current-to-voltage and voltage-to-current converters. 	1. Chapter 4 (Regh & Sartori) 2. Class notes and Black board course notes	<ul style="list-style-type: none"> Midterm Exam Lab Assignment Quizzes
Module 5: Operational Amplifiers- Part 3 Topics: CMRR (common mode rejection ratio), GBW Gain-Bandwidth products, Instrumentation Amplifiers and Noise reduction in electronic circuits	<ul style="list-style-type: none"> Explain techniques to reduce noise in electronics circuits. 	1. Class notes and Black board course notes	<ul style="list-style-type: none"> Midterm Exam Lab Assignment Quizzes
Module 6: Operational Amplifiers- Part 4 Topics: Comparators, Schmitt Triggers and Window detectors.	<ul style="list-style-type: none"> Explain the functionality and application of comparators and Schmitt triggers. 	1. Chapter 4 (Regh & Sartori) 2. Class notes and Black board course notes	<ul style="list-style-type: none"> Lab Assignment Final Exam Quizzes

Module	Course Learning Outcomes	Resources	Assessments
Module 7: Thyristors (SCR's) Topics: SCR characteristics, SCR in DC and AC circuits, SCR Data sheets. SCR triggering using Diacs.	<ul style="list-style-type: none"> Describe the principles, triggering and applications of Thyristors and Triacs. 	1. Chapter 5 (Regh & Sartori) 2. Class notes and Black board course notes	<ul style="list-style-type: none"> Lab Assignment Final Exam Quizzes
Module 8: Triacs Topics: Triacs characteristics, Triacs in DC and AC circuits. Triac phase control and Triac triggering using UJT (unijunction transistor).	<ul style="list-style-type: none"> Describe the principles, triggering and applications of Thyristors and Triacs. 	1. Chapter 5 (Regh & Sartori) 2. Class notes and Black board course notes	<ul style="list-style-type: none"> Lab Assignment Final Exam Quizzes
Module 9: Signal processing of automation sensors-Part 1 Topics: Thermocouple (TC) operation, TC data sheets. TC voltage amplification and cold junction compensation.	<ul style="list-style-type: none"> Explain how to amplify and process small signals from temperature and pressure sensors. 	1. Chapter 6 (Regh & Sartori) 2. Class notes and Black board course notes	<ul style="list-style-type: none"> Lab Assignment Final Exam Quizzes
Module 10: Signal processing of automation sensors-Part 2 Topics: Pressure sensors (PS), PS in Wheatstone bridge, Temperature drift in PS.	<ul style="list-style-type: none"> Explain how to amplify and process small signals from temperature and pressure sensors. 	1. Chapter 6 (Regh & Sartori) 2. Class notes and Black board course notes	<ul style="list-style-type: none"> Lab Assignment Final Exam Quizzes

Required Resources

Regh James A. , Sartori Glenn J.(2006). *Industrial Electronics*. Upper Saddle River, New Jersey: Pearson Prentice Hall.

Essential Skills

Section	Skills	Measurement	Details
Communication	<ul style="list-style-type: none"> Writing Speaking Visual Literacy 	Reinforce and measure	<ul style="list-style-type: none"> Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience. Tests, assignments, reports, presentations.

Section	Skills	Measurement	Details
Numeracy	<ul style="list-style-type: none"> Understanding and applying mathematical concepts and reasoning Analyzing and using numerical data 	Teach and measure	<ul style="list-style-type: none"> Execute mathematical operations accurately. Tests, assignments, reports, presentations.
Critical Thinking and Problem-Solving	<ul style="list-style-type: none"> Analysing Synthesizing Evaluating Decision-Making Creative and Innovative Thinking 	Reinforce and measure	<ul style="list-style-type: none"> Apply a systematic approach to solve problems. Use a variety of thinking skills to anticipate and solve problems. Tests, assignments, reports, presentations.
Information Management	<ul style="list-style-type: none"> Gathering and managing information Selecting and using appropriate tools and technology for a task or project 	Reinforce and measure	<ul style="list-style-type: none"> Locate, select, organize, and document information using appropriate technology and information systems. Tests, assignments, reports, presentations.
Interpersonal Skills	<ul style="list-style-type: none"> Teamwork Conflict resolution Networking 	Reinforce and measure	<ul style="list-style-type: none"> Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals. Tests, assignments, reports, presentations.
Personal Skills	<ul style="list-style-type: none"> Managing self Managing change and being flexible and adaptable 	Reinforce and measure	<ul style="list-style-type: none"> Manage the use of time and other resources to complete projects. Tests, assignments, reports, presentations.
Personal Skills	<ul style="list-style-type: none"> Engaging in reflective practice Demonstrating personal responsibility 	Reinforce and measure	<ul style="list-style-type: none"> Take responsibility for one's own actions, decisions, and consequences. Tests, assignments, reports, presentations.
Interpersonal Skills	<ul style="list-style-type: none"> Relationship management 	Reinforce and measure	<ul style="list-style-type: none"> Show respect for diverse opinions, values belief systems, and contributions of others. Tests, assignments, reports, presentations.

Section	Skills	Measurement	Details
Information Management	<ul style="list-style-type: none"> Gathering and managing information Computer literacy Internet skills 	Reinforce and measure	<ul style="list-style-type: none"> Analyze, evaluate, and apply relevant information from a variety of sources. Tests, assignments, reports, presentations.
Communication	<ul style="list-style-type: none"> Reading Listening Presenting 	Reinforce and measure	<ul style="list-style-type: none"> Respond to written, spoken, or visual messages in a manner that ensures effective communication. Tests, assignments, reports, presentations.

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)
- Skills Test
- Interview

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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