University of Manitoba | Price Faculty of Engineering
Department of Electrical and Computer Engineering

Course Outline

Instructor
- Abolfazl Babaei
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Office Hours
- By appointment

Teaching Assistant
- Mehdi Allameh
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Contact Hours
- 4 credit hours
- Lectures:
  3 hours x 12 weeks = 36 hours
- Laboratories:
  3 hours x 5 weeks = 15 hours

Prerequisites:
- ENG 1450 Introduction to Electrical and Computer Engineering
- MATH 2132 Engineering Mathematical Analysis 2

Course Website:
https://umanitoba.ca/umlearn

Important Dates

- **Term Test**
  Thursday, March 4th, 2021
  6:00PM – 8:00PM
- **Voluntary Withdrawal Deadline**
  March 31st, 2021
- **Louis Riel Day**
  February 15th, 2021
  No classes or examinations
- **Spring Break**
  February 16th – 19th, 2021
  No classes or examinations
- **Good Friday**
  April 2nd, 2021
  No classes or examinations

ECE 3010 – Elements of Electric Machines & Digital Systems

Winter 2021

IMPORTANT NOTICE – In-Person Laboratories

This course will be delivered using online lectures and *in-person laboratories*. ***Students are required to pre-screen themselves*** before travelling to campus for their laboratory and must not attend the campus if they are experiencing any COVID-19 symptoms or if they have been in contact with someone who has tested positive for COVID-19. In addition, ***students must wear a face mask*** while attending the laboratory and in all common indoor spaces on campus, or whenever social distancing can not be maintained. For further information, please visit the *UofM COVID-19 Resources* website (https://umanitoba.ca/coronavirus/recovery).

Course Objectives

The objective of this course is to introduce elementary concepts in AC circuits, electric machines, and digital sub-systems. Topics include electrical impedance, capacitors, inductors, electric motors and generators, logic gates, decoders, multiplexing, flip flops, registers, microprocessor structures, I/O and data acquisition.

Course Content

The following topics will be covered:

- Introduction to digital devices.
- Digital systems: basic computer model; input and output; and microcontroller hardware and software.
- Basics of linear direct current circuits.
- DC machines.
- Basics of linear alternating current circuits.
- AC machines.

Textbook

Elements of Electric Machines and Digital Systems, Blair Yoshida, 2016 (available from instructor).

Other Resources

Using Microprocessors and Microcomputers: the Motorola Family, by Greenfield and Wray.
The 68HC11 Microcontroller, by J.D. Greenfield.
Digital Design by Morris Mano.
Electronics: Circuits & Devices by Ralph J. Smith.
(These reference texts will be available through Library Reserve.)

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.

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Accreditation Details

Accreditation Units

- Mathematics: 0%
- Natural Science: 0%
- Complementary Studies: 0%
- Engineering Science: 75%
- Engineering Design: 25%

Graduate 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 to 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)

Grading Scale

Letter	Mark
A+	95–100
A	85–94
B+	80–84
B	70–79
C+	65–69
C	55–64
D	45–54
F	< 45

Note: These boundaries represent a guide for the instructor and class alike. Provided that no individual student is disadvantaged, the instructor may vary any of these boundaries to ensure consistency of grading from year-to-year.

Learning Outcomes

1. Understand the operation of basic digital circuits, and the ability to describe and design basic digital circuits.
2. Understanding how basic digital circuits can be combined into a programmable digital system, and the interfacing to and code execution of these systems.
3. Understanding the basic construction, operation and terminal analysis of a DC machine.
4. Understanding the basic construction, operation and terminal analysis of an AC machine.

Expected Competency Levels

Outcome	KB	PA	IN	DE	ET	IT	CS	PR	IE	EE	EP	LL
1	3	4	4	5			3					2
2	3	4	3	5	3							2
3	3	4	3									2
4	3	4	3									2

Evaluation

Students must receive a minimum of 50% on the final examination in order to be eligible to receive a passing grade. Programmable calculators are not allowed in the mid-term test and final examination. Students must complete all laboratories to be eligible to receive a passing grade.

Component	Value (%)	Method of Feedback	Learning Outcomes Evaluated
Assignments	15	F, S	1, 2, 3
Quizzes	30	F, S	1, 2, 3, 4
Laboratories	15	F	1, 2, 3, 4
Term Test	15	F, S	1, 2
Final Examination	25	S	1, 2, 3, 4

∗ Method of Feedback: **F** - Formative (written comments and/or oral discussion), **S** - summative (numerical grade)

CEAB Graduate Attributes Assessed

KB.3 – Recalls and defines, and/or comprehends and applies information, first principles, and concept in fundamental engineering science.

IN.3 – Interprets results and reaches appropriate conclusions.

Requirements and 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 passing 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, 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.