

ENG PHYS 2E04
Analog and Digital Circuits
Winter 2017
Course Outline

CALENDAR/COURSE DESCRIPTION

Design and analysis of analog and digital electrical circuits-component analysis, circuit analysis and theorems, binary numbers, Boolean analysis and digital circuit design.

PRE-REQUISITES AND ANTI-REQUISITES

Prerequisite(s): PHYSICS 1E03, and registration in an Engineering Physics or Mechatronics

INSTRUCTOR OFFICE HOURS AND CONTACT INFORMATION

Dr. Leyla Soleymani
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Office Hours:
Wednesdays 1:00-2:00 pm

Lab Supervisor: Christopher Mitchelitis
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TEACHING ASSISTANT OFFICE HOURS AND CONTACT INFORMATION

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|--------------------|-------------------------|--------------------------|-----------------------|---------------------|---------------------------|
| S. Saha sahask@ | A. Hosseini hosses2@ | M. R. Hasan hasanm10@ | L. Toteng totengl@ | J. Yang yangj55@ | P. Pastolero pastolpr@ |
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COURSE WEBSITE/ALTERNATE METHODS OF COMMUNICATION

<http://avenue.mcmaster.ca/>

COURSE ORGANIZATION AND COMPONENTS

Suggested Problems

Problems for self-training will be regularly given at the lectures and will be posted on the course website. It is highly recommended that students solve these problems. They will not be formally graded, but solutions for some of them will be discussed in lectures and/or posted.

Two assignments will be posted on the course website and will be due on the date specified.

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| Assignments | Late assignments are not accepted and a grade of ZERO will be assigned. The assignments must be submitted to the assignment drop boxes across the hall from the Engineering Physics office. (JHE A315) |
| Examinations | Midterm exam on 28 February 2017 from 18:30-20:30, the room TBA. Final exam, cumulative, during exam period, closed book. |
| Instructional Laboratory | Laboratory manuals are available on the website. Laboratory work can only be carried out at your scheduled time. All lab experiments must be done. Laboratory experiments will be done in groups of 2 but laboratory reports must be submitted <u>individually</u> at the beginning of the lab <u>one week</u> following the lab was scheduled. Attendance will be taken by the TAs during each lab, lab notes must be signed by the TA and must be submitted with the lab report. Lab reports submitted for labs not attended are not acceptable. Late reports will not be marked and a grade of ZERO will be assigned. <u>Students are not allowed to participate in labs without attending the safety lecture (first part of lab 1) and submitting the safety quiz.</u> |
| Pre-Labs | Pre-labs for the instructional labs 1-5 are posted on the course website. These must be submitted at the beginning of each lab and before the start of each lab session. These will contribute to 15% of the final grade for each lab. |
| Design Laboratory | Design laboratory instructions and project descriptions are available on the course website. Attendance during the simulation and implementation labs are mandatory. Laboratory (implementation and simulation) demos must be performed on the dates specified. Late demos will not be marked and a grade of ZERO will be assigned. Design laboratory projects are performed in groups of 2 but <u>graded individually</u> . The design project report is due on Friday April 7th at 11:59 PM through the Avenue to Learn dropbox system. The reports must be submitted individually. Late reports will not be marked and a grade of ZERO will be assigned. <u>One student per group must have access to a laptop computer for in-lab simulation and myDAQ data acquisition.</u> |

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| COURSE OBJECTIVES |
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By the end of this course, students should be able to:

- Analyze analog and digital electrical circuits;
- Simulate analog and digital electrical using software-based tools;
- Design, implement and test analogue and digital electrical circuits using simulation software and laboratory measurement equipment.
- Perform circuit measurements taking into account the specifications of electrical measuring equipment.

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| MATERIALS AND FEES |
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Required Text:

Principles and Applications of Electrical Engineering, 6th edition, Giorgio Rizzoni, McGraw Hill

Reference Texts:

Fundamentals of Electric Circuits, Charles K. Alexander and Matthew N.O. Sadiku, publisher McGraw Hill

Digital Electronics Principles and Applications, 6th Edition, Roger L. Tokheim, Glencoe, publisher McGraw Hill

Calculator:

Only the McMaster Standard Calculator will be permitted in tests and examinations. This is available at the Campus Store.

Other Mandatory Materials:

NI Multisim simulation software.

| COURSE OVERVIEW | | |
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| Date/Week | Topic | Readings (text book sections) |
| 1 | Basic Concepts | 1.5, 2 |
| 2 | Circuit Analysis and Circuit Theorems | 3 |
| 3 | Transients | 4.1, 4.3, 5.1, 5.2, 5.3 |
| 4 | Transients | 4.1, 4.3, 5.1, 5.2, 5.3 |
| 5 | Phasors and Impedance | 4.4, 4.5, 4.6 |
| 6 | AC Power analysis and Frequency Domain Analysis | 7.1, 7.2, 7.3, 7.4 (section on maximum power transfer), 6.1, 6.3, 6.4 |
| 7 | Introduction to Digital Circuits | 13 |
| 8 | Study Break | |
| 9 | Karnaugh Maps and Combinational Logic Modules | 13 |
| 10 | Sequential Logic | 14, 15 |
| 11 | Sequential Logic | 14 |
| 12 | Digital Circuit Design and Finite State Machines | 14 |
| 13 | Frequency Domain Revisit and Examples | 6 |
| 14 | Digital and Analogue Circuit Examples | |

| ASSESSMENT | |
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| Component | Weight |
| Assignments | 5% |
| Midterm Exam | 20% |
| Final Exam | 50% |
| Instructional Labs (including prelabs) | 10% |
| Design Lab – Simulation Demo | 5% |
| Design Lab – Implementation Demo | 5% |
| Design Lab –Final Report | 5% |
| Total | 100% |

- In order to pass the course you must obtain a pass mark (50% or more) in the instructional labs + design lab sections AND obtain a pass mark (50% or more) in non-lab components.
- Students must attend all labs and submit all lab-related materials to pass.
- Students are not allowed to participate in labs without attending the safety lecture (first part of lab 1) and submitting the safety quiz.
- Students who are repeating the course are allowed to transfer their passing lab grades from the previous year (2013). However, their grades will be rescaled to reflect the current year's grading scheme. The instructor must be notified during the first week of class if this option is to be chosen.

ACCREDITATION LEARNING OUTCOMES

Disclaimer: The Learning Outcomes defined in this section are measured for Accreditation purposes only, and will not be taken into consideration in determining a student's actual grade in the course.

| Outcomes | Indicators |
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| The students will learn the basic methods of circuit analysis (1.3, Midterm, Final) | |
| The students will learn the fundamental circuit theorems (1.3, Midterm, Final) | |
| The students will learn to recognize and follow an engineering design process to implement their final design project (4.1, Design Project Demonstration and Report) | |
| The students recognize and follow engineering design principles including appropriate consideration of environmental, social and economic aspects as well as health and safety issues. (4.2, Design Project Demonstration and Report) | |
| The students propose solutions to open-ended problems. (4.3, Design Project Demonstration and Report) | |

For more information on Accreditation, please visit: <https://www.engineerscanada.ca>

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at <http://www.mcmaster.ca/academicintegrity>

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

ACADEMIC ACCOMMODATIONS

Students who require academic accommodation must contact Student accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contact by phone at 905.525.9140 ext. 28652 or e-mail at sas@mcmaster.ca. For further information, consult McMaster University's Policy for [Academic Accommodation of Students with Disabilities](#).

NOTIFICATION OF STUDENT ABSENCE AND SUBMISSION OF REQUEST FOR RELIEF FOR MISSED ACADEMIC WORK

1. The [McMaster Student Absence Form](#) is a self-reporting tool for Undergraduate Students to report absences DUE TO MINOR MEDICAL SITUATIONS that last up to 3 days and provides the ability to request accommodation for any missed academic work. Please note this tool cannot be used during any final examination period.
2. You may submit a maximum of 1 Academic Work Missed request per term. It is YOUR responsibility to follow up with your Instructor immediately (NORMALLY WITHIN TWO WORKING DAYS) regarding the nature of the accommodation. Relief for missed academic work is not guaranteed.
3. If you are absent for reasons other than medical reasons, for more than 3 days, or exceed 1 request per term you MUST visit the Associate Dean's Office (JHE/A214). You may be required to provide supporting documentation.
4. This form must be submitted during the period of absence or the following day, and is only valid for academic work missed during this period of absence.
5. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in his/her course.
6. You should expect to have academic commitments Monday through Saturday but not on Sunday or statutory holidays. If you require an accommodation to meet a religious obligation or to celebrate an important religious holiday, you may submit the Academic Accommodation for Religious, Indigenous and Spiritual Observances (RISO) Form to the Associate Dean's Office. You can find all paperwork needed here: <http://www.eng.mcmaster.ca/current/documents.html>

NOTICE REGARDING POSSIBLE COURSE MODIFICATION

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the

opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

COURSE POLICIES

1. It is the students' responsibility to regularly check the course web page (Avenue to Learn) for updates and announcements.
2. Students are required to obtain and maintain a McMaster e-mail account for timely communications between the instructor and the students.
3. You are expected to behave in a way that does not disrupt the learning experience of your peers. Disruptive behavior including making noise, leaving and entering the classroom, and use of cellular phones is forbidden and students presenting this type of behavior will be asked to leave the classroom.

ON-LINE STATEMENT FOR COURSES REQUIRING ONLINE ACCESS OR WORK

In this course, we will be using Avenue to Learn. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

REFERENCE TO RESEARCH ETHICS

The two principles underlying integrity in research in a university setting are these: a researcher must be honest in proposing, seeking support for, conducting, and reporting research; a researcher must respect the rights of others in these activities. Any departure from these principles will diminish the integrity of the research enterprise. This policy applies to all those conducting research at or under the aegis of McMaster University. It is incumbent upon all members of the university community to practice and to promote ethical behaviour. To see the Policy on Research Ethics at McMaster University, please go to <http://www.mcmaster.ca/policy/faculty/Conduct/ResearchEthicsPolicy.pdf>.