ENG PHYS 2E04
Analog and Digital Circuits
Winter 2019
Course Outline (as of 3 Dec 2018; subject to change)

INSTRUCTOR OFFICE HOURS AND CONTACT INFORMATION

Dr. Matt Minnick, minnick@mcmaster.ca, BSB/B106, Extension: 24546

Term 2:

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:30</td>
<td>Office Hour!</td>
<td>Office Hour!</td>
<td>Office Hour!</td>
<td>Office Hour!</td>
</tr>
<tr>
<td>10:30</td>
<td>Office Hour!</td>
<td>Office Hour!</td>
<td>Office Hour!</td>
<td>Office Hour!</td>
</tr>
<tr>
<td>11:30</td>
<td>Office Hour!</td>
<td>Office Hour!</td>
<td>Office Hour!</td>
<td>Office Hour!</td>
</tr>
<tr>
<td>12:30</td>
<td>2E04 Prep</td>
<td>Office Hour!</td>
<td>2E04 Prep</td>
<td>2E04 Prep</td>
</tr>
<tr>
<td>13:30</td>
<td>2E MDCL/1105</td>
<td>4A06 Prep</td>
<td>2E MDCL/1105</td>
<td>Office Hour!</td>
</tr>
<tr>
<td>14:30</td>
<td>2E Lab BSB/B102</td>
<td>2E Lab BSB/B102</td>
<td>2E Lab BSB/B102</td>
<td>2E Lab BSB/B102</td>
</tr>
<tr>
<td>15:30</td>
<td>Check</td>
<td>4A06 BSB/B101</td>
<td>Check</td>
<td>Check</td>
</tr>
<tr>
<td>16:30</td>
<td>Check</td>
<td>4A06 BSB/B101</td>
<td>Check</td>
<td>Check</td>
</tr>
</tbody>
</table>

Note: The “Check” times may also be office hours – please feel free to drop in if I’m here. However, these times are sometimes used by irregular meetings or course deliverables. You can email me to make sure I’ll be available and/or to reserve any “Office Hour!” or “Check” time for you or your group. I will always be present during an “Office Hour!” time, emergencies notwithstanding.

TEACHING ASSISTANT OFFICE HOURS AND CONTACT INFORMATION

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LAB TECHNICIAN

Peter Jonasson
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BSB/B102
Ext. 22657

COURSE WEBSITE/ALTERNATE METHODS OF COMMUNICATION

The primary method of communication will be
1. Avenue To Learn (ATL, http://avenue.mcmaster.ca/) news postings for announcements - make sure to set your ATL email settings so it emails these to you.
2. Email for individual messages.
COURSE INTENDED LEARNING OUTCOMES (ILOs)

Upon successful completion of the course, you will be able to:

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

MATERIALS AND FEES

LAPTOP COMPUTER:

Students should have a laptop capable of simultaneously running an equation solver (e.g., Maple, MATLAB, Python, etc.), a circuit solver (e.g., MultiSim, SPICE, etc.) and Microsoft Word (Windows machines are recommended, price point of $300 or up should be fine). You are required to use this for the lab tests.

REQUIRED TEXTBOOK:


OTHER MATERIALS:

NI Multisim simulation software (required for the laboratory tests)
Course notes (free on ATL)
Any McMaster standard calculator

See ATL for many useful free resources including:
1) Lecture Notes
2) Practice Problems with example solutions
3) Sample and Past Lecture Tests
4) Sample Lab Tests
5) Video tutorials through all the content on the MinnickPhysics YouTube Channel: https://youtu.be/vdhn3GjsbKs?list=PLhbHWgMknRJT_eKLFXB843NkaNHfJ37Pw
## COURSE SCHEDULE

<table>
<thead>
<tr>
<th>Week #</th>
<th>Start Date</th>
<th>End Date</th>
<th>Monday/Test</th>
<th>LabTest</th>
<th>Wed &amp; Thurs Lecture Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mon 7 Jan</td>
<td>Fri 11 Jan</td>
<td>Intro lecture (no test)</td>
<td>no lab</td>
<td>1. DC Resistive Network Analysis</td>
</tr>
<tr>
<td>2</td>
<td>Mon 14 Jan</td>
<td>Fri 18 Jan</td>
<td>1. DC Resistive Network Analysis</td>
<td></td>
<td>2. AC Steady-State Network Analysis</td>
</tr>
<tr>
<td>3</td>
<td>Mon 21 Jan</td>
<td>Fri 25 Jan</td>
<td>2. AC Steady-State Network Analysis</td>
<td></td>
<td>3. Transient Analysis</td>
</tr>
<tr>
<td>4</td>
<td>Mon 28 Jan</td>
<td>Fri 1 Feb</td>
<td>3. Transient Analysis</td>
<td></td>
<td>4. Frequency Response &amp; Filters</td>
</tr>
<tr>
<td>5</td>
<td>Mon 4 Feb</td>
<td>Fri 8 Feb</td>
<td>4. Frequency Response &amp; Filters</td>
<td></td>
<td>5. AC Power</td>
</tr>
<tr>
<td>6</td>
<td>Mon 11 Feb</td>
<td>Fri 15 Feb</td>
<td>5. AC Power</td>
<td></td>
<td>6. Digital Logic Analysis</td>
</tr>
<tr>
<td></td>
<td>Mon 18 Feb</td>
<td>Fri 22 Feb</td>
<td>Reading Week, take a break!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Mon 25 Feb</td>
<td>Fri 1 Mar</td>
<td>6. Digital Logic Analysis</td>
<td></td>
<td>7. Digital Logic Design</td>
</tr>
<tr>
<td>8</td>
<td>Mon 4 Mar</td>
<td>Fri 8 Mar</td>
<td>7. Digital Logic Design</td>
<td></td>
<td>8. Sequential Digital Logic Analysis</td>
</tr>
<tr>
<td>11</td>
<td>Mon 25 Mar</td>
<td>Fri 29 Mar</td>
<td>10. Review Test 1</td>
<td>Design Project</td>
<td>Review</td>
</tr>
<tr>
<td>12</td>
<td>Mon 1 Apr</td>
<td>Fri 5 Apr</td>
<td>11. Review Test 2</td>
<td>Design Project Due</td>
<td>Review</td>
</tr>
<tr>
<td>13</td>
<td>Mon 8 Apr</td>
<td>Fri 12 Apr</td>
<td>No Test, Review</td>
<td></td>
<td></td>
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## ASSESSMENT

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Monday Lecture Tests</td>
<td>22% (2% each * 11)</td>
</tr>
<tr>
<td>Lecture Participation Quizzes</td>
<td>Bonus: 2%</td>
</tr>
<tr>
<td>Weekly Laboratory Tests</td>
<td>24% (3% each * 8)</td>
</tr>
<tr>
<td>Laboratory Design Project</td>
<td>18%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>36%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>
### ADDITIONAL DETAILS REGARDING COURSE MANAGEMENT AND ASSESSMENT

1. Class attendance mandatory. There is a strong correlation between class attendance and performance in the course.
2. Lecture Tests every Monday will cover the material from the previous two lectures; you will need to have read the course notes, the textbook, and completed practice problems in order to succeed within the available time.
3. Lecture Quizzes will occur randomly within the lecture as a means of taking attendance and encouraging participation.
4. The Final Exam spans the knowledge from the Lecture Tests over the whole term. Sample exams will be provided in ATL.
5. Each Laboratory Test covers the material from the immediately preceding Lecture Test, and expects you to work in a group of 2 to solve a similar circuit three ways:
   a. analytically,
   b. with Multisim, and
   c. by physically building and measuring it.
6. The Design Project will start after Lab 8, and will require you to apply your skills from the lab over the entire term.

### ACCREDITATION LEARNING OUTCOMES

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.

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Indicators</th>
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<tbody>
<tr>
<td>The students will learn the basic methods of circuit analysis</td>
<td>1.3</td>
</tr>
<tr>
<td>The students will learn the fundamental circuit theorems</td>
<td>1.3</td>
</tr>
<tr>
<td>The students will apply linear differential equations to solving first order circuits</td>
<td>2.2</td>
</tr>
<tr>
<td>The students will apply complex number fundamentals to analyzing circuits in the phasor domain</td>
<td>2.2</td>
</tr>
<tr>
<td>The students will learn to recognize and follow an engineering design process to implement their final design project</td>
<td>4.1</td>
</tr>
<tr>
<td>The students will learn to use simulation software to design a digital/analog circuit</td>
<td>5.2</td>
</tr>
<tr>
<td>The students will learn to follow technical and non-technical instructions to design, implement, and test a digital/analog circuit</td>
<td>7.1</td>
</tr>
<tr>
<td>The students will learn to plan and effectively manage time, resources, and scope to address the design requirements and constraints of the design project</td>
<td>11.2</td>
</tr>
</tbody>
</table>

### 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](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 ABSENCES AND SUBMISSION OF REQUEST FOR RELIEF FOR MISSED ACADEMIC WORK

From http://mcmaster.ca/msaf/:

1. This 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.

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 your Associate Dean’s Office (Faculty Office). 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

For Eng Phys 2P04, any MSAF’d material will have its weight moved to the final exam.

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.

ON-LINE STATEMENT FOR COURSE 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.

ADDITIONAL LAB SAFETY INFORMATION
INTRODUCTION

This document describes the application of McMaster’s Workplace Environmental Health and Safety Policy to the particular situation of undergraduate labs in the Engineering Physics Department. The policy is written for students, but applies to all people involved in the labs.

McMaster’s Workplace Environmental Health and Safety Policy is reviewed by the Central Joint Health and Safety Committee each year as well as signed by our University President.

The policy applies to students, visitors and volunteers.

The policy is available at [http://www.workingatmcmaster.ca/eohss/prevention/policy/](http://www.workingatmcmaster.ca/eohss/prevention/policy/)

CHAIN OF REPORTING FOR SAFETY TRAINING AND RESPONSIBILITY

You will be provided with a health and safety lecture at the beginning of the first lab. You are responsible for ensuring that you understand this safety information. The lab technician is responsible for ensuring that all equipment is in good working order. In the event of an emergency, notify your Teaching Assistant (TA) and the lab technician. They are responsible for calling medical aid if needed.

You must report any hazardous situation of concern to one level up according to the chart below. In case this person is not available, either contact the person delegated in their absence or the person positioned at the next level up. You are expected to know this chain of reporting.
PROPER LAB BEHAVIOUR

Everyone in the lab is responsible for their own safety as well as the safety of others.

GENERAL GUIDELINES

1. Conduct yourself in a responsible manner at all times in the laboratory.
2. Follow all written and verbal instructions carefully. If you do not understand a direction or part of a procedure, ASK YOUR TA or LAB TECHNICIAN BEFORE PROCEEDING WITH THE ACTIVITY.
3. Never work alone in the laboratory.
4. Perform only those experiments indicated by the lab manual or your TA/lab technician. Carefully follow all instructions, both written and oral. Unauthorized experiments are not allowed.
5. Do not eat food or drink beverages outside of the designated area in the laboratory. Do not use laboratory glassware as containers for food or beverages.
6. Be prepared for your work in the laboratory. Read all procedures thoroughly before entering the laboratory. Never fool around in the laboratory. Horseplay, practical jokes, and pranks are dangerous and prohibited.
7. Observe good housekeeping practices. Work areas should be kept clean and tidy at all times. Keep backpacks and overcoats out of traffic areas.
8. Be alert and proceed with caution at all times in the laboratory. Notify the TA or lab technician immediately of any unsafe conditions you observe.
9. Labels and equipment instructions must be read carefully. Set up and use the equipment as directed by your lab manual.
10. Experiments must be personally monitored at all times. Do not wander around the room, distract other students, startle other students or interfere with the laboratory experiments of others.
11. Dress properly during a laboratory activity. Long hair, dangling jewelry, and loose or baggy clothing are a hazard in the laboratory. Long hair must be tied back, and dangling jewelry and baggy clothing must be secured. Proper footwear must be worn, no flip flops, high heels, roller blades, etc..
12. Report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the TA or lab technician immediately, no matter how trivial it seems.
13. Cell phones and use of music headphones should be avoided while working in the lab. They can be distracting and thereby increase the potential for an accident to occur.
14. Do not store food and drinks in refrigerators that are for lab supplies and vice versa.


**PROCEDURE TO FOLLOW IN THE CASE OF AN ACCIDENT**

Know the locations and operating procedures of all safety equipment including: first aid kit(s), and fire extinguisher. Know where the fire alarm and the exits are located.

Know what to do if there is a fire drill during a laboratory period; turn off any electrical equipment in the event of a fire drill and leave the building.

In the case of an accident, notify your TA and the lab technician immediately. They will phone the emergency extension 88 in the event of an accident. Remain until medical aid arrives. If the TA or lab technician is unavailable, dial 88 yourself from a campus phone or 905-522-4135 (Security).