PHYSICS 2055: Electricity and Magnetism

WINTER 2018: Sections 001, 002, and 003
LECTURES: SLOT 05: Monday, Wednesday, & Friday (12:00-12:50) in C2045

LABS:
SECTION 001: Monday 2:00-4:50 pm in C3061, CRN 60903
SECTION 002: Thursday 9:00-11:50 am in C3061, CRN 65685
SECTION 003: Tuesday 2:00-4:50 pm in C3061, CRN 74918
INSTRUCTOR: Prof. Qiying Chen, Rm. C3027, 864-8878; Email: qiyingc@mun.ca
OFFICE HOURS: Every Monday, 13:00-14:00, Physics Help Centre (C3071); every Friday, 13:00-14:00, C3027; or by appointment.

COURSE TEXT: Randall D. Knight, Physics for Scientists and Engineers A Strategic Approach, 4th edition, Pearson Education, Inc.
(Note: The textbook is available from the MUN bookstore for $120.00, which may be available at a reduced price when bundled with some chemistry texts. Check with the MUN bookstore for details. The companion student workbook is not required.)

Calendar Entry: **2055**
Electricity and Magnetism
This course builds upon the concepts of electric and magnetic forces and fields, Gauss's Law, electric potential and electromagnetic induction introduced in PHYS 1051, expanding them to introduce capacitance, their application in DC and AC circuits, electromagnetic waves, wave optics, and geometric optics.
CO: Mathematics 2000
LH: 3; (Note: normally there will be eleven laboratory sessions per semester)
PR: Mathematics 2000, PHYS 1051, Science 1807

OUTLINE:

Topic	Text Sections (For reference only)	Number of Lectures
Introduction, Electric Fields & Coulomb's Law	(22.1-22.5, 23.1-23.4)	1
Electric Flux, Gauss's Law, & Applications	(24.1-24.6)	1.5
Electric Potential	(25.1-25.4, 25.7, 26.1, 26.2)	1.5
Current and Resistance	(27.1-27.5)	2
Capacitance and Dielectrics	(26.5 - 26.7)	2
Direct-Current Circuits	(28.1-28.9)	2
Magnetic Fields	(29.1-29.5)	2
Sources of Magnetic Field	(29.5, 29.6, 29.10)	2
Faraday's Law	(30.1-30.7)	2
Inductance & RLC Circuit	(30.8-30.10)	3
Alternating-Current Circuits	(32.1-32.6)	4
Electromagnetic Waves	(31.1-31.7)	3
Ray Optics	(34.1-34.6, 35.1-35.4)	4
Wave Optics	(33.1-33.8)	4
Review (optional)		1

EVALUATION SCHEME:

Labs	20%
Assignments (best 8 out of 9)	15%
Mid-Term Tests (x2)	30%
Final Exam	35%
Total	**100%**

Notes:
1. A minimum Lab mark of 50% is required to pass the course. Lab waivers will NOT be granted.
2. Make-up term tests will **NOT** be available. In cases where a test has been missed due to illness, you must notify the instructor in writing within seven days for any absence.
3. Information on the Lab portion of this course is available from D2L (Brightspace or Desire2Learn).
4. All assigned experiments must be completed. If you miss a lab because of illness or other justifiable reasons, a make-up session should be arranged with the Lab Instructor (Dr. C. Deacon, cdeacon@mun.ca) - within ONE WEEK after the missed lab. Failure to complete all experiments will result in a mark of zero for lab(s) missed.

LABORATORY: Labs will be done in C3061. Lab slots are two hours and fifty minutes in length. Lab Slots are 61 (Section 001, Monday afternoon: 2:00 - 4:50 pm), 44 (Section 002, Thursday morning: 9:00 - 11:50 pm), and 62 (Section 003, Tuesday afternoon: 2:00 - 4:50 pm). There will be no lab classes during the week of February 18 - 22.

All instruction sheets and supplemental information can be downloaded from D2L. Select *Course Content → Lab Experiments* to access the list of experiments for this course. It is recommended that you bring your textbook to the lab because it is often necessary to look up information which is not included in the instruction sheets. The schedule of experiments is listed below. You should prepare for each lab by:
⎯ completing the assigned pre-lab question(s). Failure to complete the prelab questions will result in not only losing the mark, but also not being prepared for the experiment at hand.
⎯ printing or downloading the appropriate lab notes in advance,
⎯ reading the relevant theory and background in the textbook,
⎯ planning your experiment by figuring out what sort of data you expect to get and how to analyze it.
⎯ Remembering, too, that experimental errors or uncertainties will arise in all of your experiments and you will be expected to perform error analysis as a regular part of lab. It is recommended that you download the reference notes: *The Treatment of Numerical Experimental Results*.

Instead of lab notebooks, you are expected to submit your completed lab reports electronically, using Labarchives. It contains a built-in word processor and allows you to import images and tables. You are free to use the laboratory computers, but you may find it convenient to bring your own laptop or tablet. The URL is https://mynotebook.labarchives.com/login. Your completed lab report should be submitted no later than midnight, the day following your lab session. No additional time will be permitted.

You are required to design a poster which summarizes the results of one of the experiments which you have performed in the laboratory. Please find details from D2L.

Pay attention to lab safety and follow the regulations. Please understand lab regulations and discuss with the lab instructor in case you have any question with regard to lab safety.

LAB SCHEDULE:

LAB SCHEDULE	Sect 001	Sect 002	Sect 003
1. Introduction to Lab	Jan. 7	Jan. 10	Jan. 8
2. Linear and Nonlinear Resistors	Jan. 14	Jan. 17	Jan. 15
3. Introduction to the Arduino	Jan. 21	Jan. 24	Jan. 22
4. Charge and Discharge of a Capacitor	Jan. 28	Jan. 31	Jan. 29
5. Introduction to Oscilloscope	Feb. 4	Feb. 7	Feb. 5
6. The RC Circuit	Feb. 11	Feb. 14	Feb. 12
7. Resonance in LCR Series Circuit	Feb. 25	Feb. 28	Feb. 26
8. e/m for Electrons	Mar. 4	Mar. 7	Mar. 5
9. Black Box Problem	Mar. 11	Mar. 14	Mar. 12
10. Snell's Law	Mar. 18	Mar. 21	Mar. 19
11. Geometrical Optics	Mar. 25	Mar. 28	Mar. 26

ASSIGNMENTS: There are nine assignments throughout the semester, including one optional assignment. Your best performance in eight assignments will be counted in the final mark. The assignments won't be collected after the due dates. In general, one assignment will be posted on D2L on every Friday (except the first and last weeks, and the test weeks), which is due 10 days later on the Monday of the further next week. The solutions of the assignments will be posted on D2L.

TERM TESTS: There are two term tests for this course, which are scheduled for Friday Feb. 8, 2019 and Friday Mar. 15, 2019 during the lecture hour (12:00 - 12:50) in the classroom (C2045). Students are required to present their student ID at term tests and exams. Make-up term tests will **NOT** be available.

In case of poor performance on a single midterm test, the higher grade of final exam will be used to replace the lowest grade of the midterm test. For example, if a student's grades are: Midterm 1 (60%), Midterm 2 (45%), and Final Exam (80%), then the grade of Midterm 2 will be replaced by the grade of the Final Exam (80%), and the student's new grades will be: Midterm 1 (60%), Midterm 2 (80%), and Final Exam (80%).

FINAL EXAM: The final exam will be scheduled in the period following the last day of lectures. It will be comprised of problems and conceptual questions and will include material from the entire semester. You will have 2.5 hours to write the final exam.

LECTURE NOTES: The act of compiling a complete set of notes, including the drawing of diagrams, contributes significantly to your ability to organize and recall important information. An archive of lecture notes, organized by topics, is provided to help you to fill in gaps and review complex diagrams presented in class. The most effective way for you to use the lectures and archived notes is to write down an outline of the main ideas and important points during the lecture and then to fill in the details of the outline, as soon as possible afterwards, by using the archived notes to refresh your memory of what was done in class. By doing this, you effectively review each lecture and reinforce important concepts while your recollection of the presentation is fresh and you generate a set of notes that will be of optimal use to you as study tools. Simply reading through the archived notes, without actively generating your own, is likely to be MUCH LESS EFFECTIVE as a learning strategy.

Attendance in class is an important determinant of success in this course. You cannot hope to pass this course simply by reading posted notes and by manipulating formulae provided with tests or exams. You will find that success depends on developing some intuition/physical understanding of the topics discussed in this course. The ways in which we apply mathematical descriptions of phenomena generally depends on having some underlying picture of the relevant symmetry or causal relationships. A large part of my effort in class will be directed toward helping you develop an ability to see beyond the formulae describing the phenomena we cover. My goal in lectures will be to explain how different concepts are related and how the mathematical models represent real phenomena; these are ideas that are not always conveyed by notes and the text.

SUGGESTED POST-LECTURE PROBLEMS: After each lecture, students are strongly encouraged to attempt a small number of suggested problems that have been selected to reinforce the concepts covered in that lecture.

Memorial University Online Learning (Brightspace or Desire2Learn): A computer-based course management system will be used for announcements, distribution of course materials, posting of student results, posting of lecture notes, and other important information. Please check often.

Information Required for Medical Certificates:

A student who requests permission to drop courses; to withdraw from University studies; to have examinations deferred or to obtain other waivers of University, departmental or course regulations based on health issues is required by the University to provide, in support of the request, a certificate from a health professional in the form of a note or letter. Such certificates must be sufficiently specific to allow a proper consideration of a student's case. The University requires that all such certificates must be on letterhead, must be signed by the health professional, must confirm the specific dates on which the student visited the health professional and should include details on the following:

- The degree to which the health issue is likely to have affected the student's ability to study, attend classes, or sit examinations; the degree to which the illness is likely to have affected the student's ability to study, attend classes, or sit examinations,
- The length of time over which the student's abilities were likely hampered by the condition,
- The fitness of the student to resume studies.

Confidentiality:

The University respects the confidentiality of all material contained in medical notes. Physicians are strongly advised to retain a copy of the medical note in case the medical note needs to be verified or reissued at a later date.

Use of Recording Devices in Classrooms:

The lectures and displays (and all material) delivered or provided in this course, including any visual or audio recording thereof, are subject to copyright owned by the instructor. It is prohibited to record or copy by any means, in any format, openly or surreptitiously, in whole or in part, in the absence of express written permission from the instructor any of the lectures or materials provided or published in any form during or from the course.

Important General Information from the University:

It is the student's responsibility to acquaint themselves with these items. Please read:

● **3. Student Code of Conduct:**
http://www/mun.ca/student/conduct/

● **6.8.2 Exemptions from Final Examinations:**
http://www.mun.ca/regoff/calendar/sectionNo=REGS-0628

● **6.12 Academic Misconduct:**
http://www.mun.ca/regoff/calendar/sectionNo=REGS-07488

● **Accommodations for Students with Disabilities:**
http://www.mun.ca/blundon/accommodations/

● **Last day to drop a course without academic prejudice is February 28, 2019.** See University Diary:
https://www.mun.ca/regoff/calendar/sectionNo=GENINFO-0086