Introduction to Physics IIA

PHY A21 - Winter 2013

Tuesday	6:00 pm - 7:00 pm	SW 319	Science Wing
Thursday	5:00 pm - 7:00 pm	SW 319	Science Wing

$$\left[\begin{array}{rcl} \nabla \cdot \mathbf{E} &=& 0 \\ \nabla \cdot \mathbf{B} &=& 0 \\ \nabla \times \mathbf{E} &=& -\frac{\partial \mathbf{B}}{\partial t} \\ \nabla \times \mathbf{B} &=& +\frac{\partial \mathbf{E}}{\partial t} \end{array}\right] \quad \ldots \quad \text{and there was light.}$$

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Practical Sessions: 3 hours/week
Wed. / **Fri.** 9:00 am
Wed. / **Fri.** 1:00 pm
Course Website: portal.utoronto.ca

Office Hours

Monday, Thursday, Friday	11:30 am - 1:30 pm	3:30 pm - 4:30 pm
Tuesday, Wednesday	3:30 pm - 5:30 pm	
or by Appointment (call or email to schedule)		

What is Light?

Our first answer to this question will come from our studies of **Electromagnetism**. Further queries on the nature of light will take us into **Special Relativity**. By the end of the term, we will be ready for **Quantum Mechanics** where this main question will take us into the fields of atomic and nuclear physics.

By the end of the course you will be able to:

- Identify and define the vocabulary used in the areas of Electromagnetism and Special Relativity.
- Solve analytical and numerical problems that go beyond a plug-in-the-formula approach.
- Interpret and give examples of the physical laws governing electric and magnetic interactions, electromagnetic waves, and relativistic phenomena.
- Recognize the important change in paradigm that led to the development Special Relativity and the beginning of what is known as Modern Physics.
- Using mathematics as our scientific language, employ techniques of single-variable calculus to model, simplify, and solve physical problems.
- Employ problem-solving skills useful in the analysis of physical systems, in the form of: experiments, conceptual and phenomenological questions, and multi-concept detailed problems.
- Recognize the existence of a basic model for the study of Physics, and translate this model into tools and learning skills useful in other disciplines.
- Develop strategies to implement the acquired organization, study, and discipline skills learned in the course to future academic and professional endeavours.

Requirements and Materials

- **Corequisite:** Calculus II (MATA35/36/37)

- **Prerequisites:** Introduction to Physics IA (PHYA10), Calculus I (MATA30/31)

- **Textbook:** ***Physics for Scientists and Engineers*** by Randall D. Knight (Pearson, 2nd Ed.)

U of T Bookstore SKU# 12308453, 12634378, or 12634392

The schedule provided at the end of this document indicates the readings you must do **before** each lecture. The reading quizzes and in-class participation will be based on this assigned reading.

Your first read of a given subject should focus on the main concepts, one or two examples, and a quick overview of the derivations. This will be the starting point for all lectures and consequently failing to complete it will impair your ability to understand our lecture discussions.

The textbook also provides conceptual questions and detailed problems that will be the subject of the weekly online homework, practical activities, and group quizzes. Please note that you will need an access code to **MasteringPhysics**, either through a bundled textbook or bought separately from the bookstore.

- **Student Response System:** ***i>clicker***, ***i>clicker2***, or ***i>clicker+*** by Macmillan

U of T Bookstore SKU# 10599044

You will need a clicker to answer the in-class participation quizzes. To receive the participation mark you must register your clicker by **Sunday, January 20**. Instructions are available on the course website.

Note that in order to receive this participation mark you must be present with your clicker during the lectures. Having somebody else use your clicker in your place or using somebody else's clicker in their place is a serious academic offence that could have you facing expulsion from the university.

- **Calculator:**

Texas Instruments: TI-30X IIS (SKU# 10048306)
Sharp: EL-520XB (SKU# 10048016), EL-531XB (SKU# 10047965), EL-546XB (SKU# 10047880)

For the course a **scientific** and **non-programmable** calculator will be required. The models listed above are those available at the bookstore that satisfy the course requirements.

Grading Scheme (Tentative)

Component	Points	Due Date
Reading Quizzes	0 - 5	Ongoing (Pre-Lecture)
Participation	5	Ongoing (Lecture)
Online Homework	0 - 5	Ongoing (Weekly)
Practical Activities	10	Ongoing (Weekly Practicals)
Formal Lab Reports	10	Week 7 & Week 12
Test #1	10	Week 6
Test #2	20	Week 10
Final Examination	35 - 45	Exam Period (April 15 - 30)

Grade Components

Reading Quizzes (0% - 5%)
Before each Tuesday lecture and on MasteringPhysics you will be asked a set of questions from the assigned textbook readings for that week. You will have until **11:55 am** on Tuesday to submit your answers. Each quiz is worth **5 points**, and your final grade is the total sum of all quizzes up to a maximum of **50 points**. Use the class schedule and quiz instructions to prepare for the lectures and reading quizzes.

Participation (5%)
During each lecture we will work on clicker questions from the textbook readings and the lecture presentation. During each lecture **1 point** can be earned by answering at least **75%** of the questions asked. The total sum of all lecture points makes up your participation grade up to a maximum of **20 points**. In addition, after each lecture one participation question will be selected for a performance bonus. An extra **1%** will be awarded to those students that correctly answer **50%** or more of the performance questions.

Online Homework (0% - 5%)
These will be a weekly set of questions posted on MasteringPhysics. The questions will be based on the previous week's textbook reading material and lecture discussions. Each homework is worth **10 points**, and your final grade is the average of the **best 10** results. A mix of conceptual questions and applied problem-solving exercises will be included.

Practical Sessions (20%)
In these three-hour weekly sessions we will discuss examples on the concepts introduced in your textbook readings and lecture presentations. We will apply these concepts and principles, in order to develop skills useful in scientific conceptual analysis and general problem-solving. Further work will focus on the development of experimental techniques related to Physics and the Scientific Method. Your grade will depend on group quizzes (2%), notebook-recorded group activities (8%), and two experiment-based formal lab reports (3% and 7%) written in collaboration with your assigned group.

Attendance to the practicals is **mandatory** and a deduction to your final practical grade would be applied should you miss a session. This deduction will be a percentage equal to the cube (third power), of the number of absences. More information will be provided in your first practical session during the second week of classes and in the course website under the **Practical Sessions** menu.

Test #1 (10%)
The first test will be scheduled during **Week 6** and will be **1 hour** long. This test will feature the material from the lectures and textbook readings up to and including the discussions of Thursday, February 07. The questions will also be based on the practical activities and online homework up to and including material due on the week of Monday, February 04. The format includes only multiple-choice questions. The only aids allowed are your non-programmable scientific calculator, and a hand-written, double-sided, and letter-sized equation sheet. Photocopies or computer printouts are not allowed.

Test #2 (20%)
The second test will be scheduled during **Week 10** and will be **2 hours** long. This test will feature the material from the lectures and textbook readings up to and including the discussions of Thursday, March 14. The questions and problems will also be based on the practical activities and online homework up to and including material due on the week of Monday, March 11. The format includes multiple-choice questions as well as detailed problems. The only aids allowed are your non-programmable scientific calculator, and a hand-written, double-sided, and letter-sized equation sheet. Photocopies or computer printouts are not allowed.

Final Examination (35% - 45%)
The final examination will be scheduled during the exam period of **April 15 - 30**. Material for the final examination will include all the topics discussed in the assigned textbook readings, lecture presentations, online homework, and practical sessions. The final examination will be **3 hours** long and the format includes multiple-choice questions as well as detailed problems. The only aids allowed are your non-programmable scientific calculator, and a hand-written, double-sided, and letter-sized equation sheet. Photocopies or computer printouts are not allowed.

Class Policies

Name and Student Number
Any work you hand in must clearly indicate your name and student number, this includes practical activities, formal reports, tests, and the final exam. Any work you submit that fails to meet this requirement will be penalized with a 10% deduction, provided we are able to identify the work as yours. If we are unable to identify the work as yours, a grade of zero will be awarded.

In-class Conduct

- Please turn **off** all cellphones, laptop computers, and tablets when you come into the class.
- Class starts at 6:10 pm on Tuesday and 5:10 pm on Thursday, ending at 7:00 pm both days. Late arrival or early departure is inappropriate and will negatively affect your participation grade.
- Do not bring food into the classroom as this creates unwanted distractions that will affect the learning environment.
- Regarding anything that you might want to use in the classroom: if you are not using it to perform a task specifically related to what we are doing in class at that very moment, please put it away.

e-mail
If you want to ask a question via e-mail, please first check the electronic forums in the **Discussion Board** of the course website. Quite likely, you are not the only person with that same question, and if that question has already been asked, you will find the answer there. If the question has not been asked, go ahead and post it yourself instead of sending it by e-mail. This way you will also help other students facing the same issue. The forums in the discussion board are monitored regularly by the course instructor and your peers, making it the best way of communicating for various queries of diverse nature.

However, if the electronic forums are not the best place for your query, make sure you send your e-mail from an official **utoronto.ca** address (e.g., your UTmail+ account), as all other addresses will be filtered out automatically. Furthermore, include the code **PHYA21** somewhere in the subject line of your message, to ensure a quicker response time. I reply to e-mails within a period of 24 hours and I rarely reply to e-mails during weekends.

Absences
There will be no makeup options for practical activities, formal reports, or the tests. In the case of a **valid** and **documented** problem that supports an absence to a practical session, the grade will be calculated on the basis of all other submitted work. In the case of a **valid** and **documented** problem that supports an absence to the first test, the second test will have its weight increased accordingly. In the case of a **valid** and **documented** problem that supports an absence to the second test, the final examination will have its weight increased accordingly.

Academic Integrity and Respect for the Academic Endeavor
Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's *Code of Behaviour on Academic Matters:*

http://www.governingcouncil.utoronto.ca/policies/behaveac.htm

outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

- In papers and assignments: Using someone else's ideas or words without appropriate acknowledgment; submitting your own work in more than one course without the permission of the instructor; making up sources or facts; obtaining or providing unauthorized assistance on any assignment; using someone else's clicker or multiple clickers for participation grades.
- On tests and exams: Using or possessing unauthorized aids; looking at someone else's answers during an exam or test; misrepresenting your identity.
- In academic work: Falsifying institutional documents or grades; falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the *Code of Behaviour on Academic Matters*. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see http://www.utoronto.ca/academicintegrity/resourcesforstudents.html).

Course Support

Access*Ability*
Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the Access*Ability* Services Office as soon as possible. I will work with you and Access*Ability* Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC Access*Ability* Services staff (located in SW302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or ability@utsc.utoronto.ca

Discussion Board
The course website supports electronic forums useful for questions and discussions on course content, conceptual and detailed problems, textbook readings, as well as any issues relating to administrative details of the course such as deadlines, future topics, and scheduling. It is recommended that you check the forums on a regular basis to keep on top of current issues. You can subscribe to the various forums in order to receive email notifications when new posts are available, and there are also options for posting anonymously.

Physics Aid Centre
Located in SW503, this centre is managed and run by the Environmental and Physical Sciences students' Association (EPSA) and the Department of Physical and Environmental Sciences (DPES). Selected outstanding students will be available to offer help with questions and problems in Physics. The schedule will be posted on their website at http://www.myepsa.ca/resources/physic-aid-centre/

Lecturecasts and Lecture Notes
Videos of the lectures will be available after each session and will remain accessible for a period of two weeks. The slides from the lectures will be made available on the course website after each lecture.

Facilitated Study Groups (FSG) - Tentative
Facilitated Study Groups are structured, weekly study groups for this class and other selected UTSC classes. Students share study strategies, compare notes and strategize for exams in a low-key, comfortable environment. FSG days and times will be announced in the course website. Everyone is welcome!

Class Schedule

This schedule is ***tentative*** and might change during the term in order to accommodate for variations in the lectures in response to student performance and understanding of the various topics.

Please note that it is your responsibility to read the assigned sections and chapters **before** each lecture. The lecture discussions will **not** be a direct repetition of the basic material found in the textbook.

Failing to complete the readings before each lecture will hinder your ability to understand the class discussions as a minimum understanding of the basic concepts will be assumed from the assigned reading.

Dates	**Tuesday Lecture** 6pm - 7pm	**Thursday Lectures** 5pm - 6pm / 6pm - 7pm
Jan. 08	**Standing Waves** Ch.21: 1 - 4	**Wave Interference** Ch.21: 5 - 7
Jan. 10		**Beats** Ch.21: 8
Jan. 15	**Electric Charge & Force** Ch.26: 1 - 4	**The Field Model** Ch.26: 5
Jan. 17		**Field of Point Charges** Ch.27: 1 - 2
Jan. 22	**Continuous Distributions** Ch.27: 3 - 4	**The Capacitor** Ch.27: 5
Jan. 24		**Motion in Electric Fields** Ch.27: 6 - 7
Jan. 29	**Electric Potential Energy** Ch.29: 1 - 3	**Electric Potential** Ch.29: 4 - 5
Jan. 31		**Multiple Charges** Ch.29: 6 - 7
Feb. 05	**Potential & Field** Ch.30: 1 - 4	**Capacitance & Dielectrics** Ch.30: 5 - 7
Feb. 07		**Current & Resistance** Ch.31: 1 - 5
Feb. 12	**Circuit Laws** Ch.32: 1 - 3	**Resistor Circuits** Ch.32: 4 - 7
Feb. 14		***RC* Circuits** Ch.32: 8 - 9
Feb. 19	**Reading Week**	**Reading Week**
Feb. 21		**Reading Week**
Feb. 26	**Magnetism** Ch.33: 1 - 3	**Magnetic Fields** Ch.33: 4 - 6
Feb. 28		**Magnetic Forces** Ch.33: 7 - 10
Mar. 05	**Induction** Ch.34: 1 - 3	**Lenz & Faraday** Ch.34: 4 - 5
Mar. 07		**Inductance & Circuits** Ch.34: 6 - 10
Mar. 12	**Electromagnetic Waves** Ch.35: 1 - 7	**Wave Optics** Ch.22: 1 - 2
Mar. 14		**Diffraction** Ch.22: 3 - 5
Mar. 19	**Einstein's Postulate** Ch.37: 1 - 4	**Time Dilation** Ch.37: 6 - 7
Mar. 21		**Length Contraction** Ch.37: 7
Mar. 26	**The Spacetime Interval** Ch.37: 8	**Spacetime Diagrams** Ch.37: 8
Mar. 28		**Lorentz Transformations** Ch.37: 8
Apr. 02	**Relativistic Momentum** Ch.37: 9	**Causality** Ch.37: 9
Apr. 04		**Relativistic Energy** Ch.37: 10