

# PHYA21H3Y-Physics II for the Physical Sciences syllabus

Summer 2021

”The darkness of the night cannot stop the light of morning”

-African Proverb (Current day Cameroon region)

”I salute the light within your eyes where the whole Universe dwells. [...]”

-Chief Crazy Horse (Lakota People’s Leader)

”And God said, ”Let there be light” , and there was light. ”

- Book of Genesis 1:3

”If there is light in the soul, there will be beauty in the person. [...]”

-Chinese Proverb

## 1 Instructors Info, Course Website and Weekly schedule

**Instructor:** Aris Spourdalakis

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Please allow **One bussiness day** for any message to be answered.

**Teaching Assistants:**

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**Course Website:** <https://q.utoronto.ca>

### Weekly Schedule

Lectures	Office Hours
Tuesdays 10:10-12:00am	Wednesdays 4:00-5:00pm
Thursdays 10:10-11:00am	Thursdays 4:00-5:00pm

<b>Practicals</b> Wednesdays 09:00-11:00am <b>OR</b> 1:00-3:00pm
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**Important Academic dates:** <https://www.uts.utoronto.ca/registrar/summer-2021-academic-dates>

## 2 Requisites and Exclusions

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

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

**Exclusion:** PHYA22H3, (PHY110Y1), PHY132H1, PHY135Y1, (PHY138Y1), PHY152H1

**Breadth Requirements:** Natural Sciences

### 3 Learning goals

#### What is Light?

We will try to answer this question by introducing basic concepts from Electrostatics, Magnetostatics, Electromagnetism, Electrodynamics, Magnetodynamics and Wave Mechanics. More specifically, by the end of the course, you will have the foundation to begin learning about modern physics, in which basic questions about the properties of light play a central role. This will open the door for you to go onto to study subjects including Quantum Mechanics, Relativistic Field theory and Astrophysics.

By successfully completing this course, you will be able to:

- Identify and define the basic vocabulary used in the study of Wave motion and related phenomena, Electricity and Magnetism, and Special Relativity.
- Interpret and give examples of the physical laws governing electric and magnetic interactions, electromagnetic waves, and relativistic phenomena.
- Explain basic concepts of the aforementioned physics in terms understandable by non-scientists, peers and juniors.
- Employ techniques of single-variable calculus to model, simplify, and solve physical problems.
- Use techniques of analytical and numerical problem solving that go beyond “plug-in-the-formula”.
- Employ individual and group problem-solving skills to the analysis of physical systems, in the form of: experiments, conceptual and phenomenological questions, and multi-concept detailed problems.
- Recognize some of the Big Ideas and methods that underline the discipline of Physics, and translate them 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 areas.

### 4 Description and Resources

This second physics course is intended for students in physical and mathematical sciences programs. Topics include electromagnetism and special relativity.

#### **Textbook and NewWileyPLUS:**

The textbook for this course is:

*Fundamentals of Physics*, by Halliday, Resnick, and Walker (Wiley, 11th Ed.)

The schedule provided at the end of this document indicates the readings you must complete before each lecture. The reading quizzes and in-class participation will be based on these assigned readings. Your first time reading the assigned material does not need to be highly detailed. Focus on the main concepts, read one or two examples, and browse quickly through any derivations. This first reading will be the assumed starting point for all lectures. Therefore, failing to complete the readings and associated reading quizzes will impair your ability to understand our lecture discussions.

The textbook and online NewWileyPlus resources also provides the conceptual questions and detailed problems that will be the subject of the weekly online homework, practical activities, and quizzes. To complete the online homework you will need a registration code for **NewWileyPLUS**, available at the UofT Bookstore, either as an access card bundled with the textbook or as a digital-only resource. Once you have a registration code, follow any WileyPLUS link on the course website to complete your registration.

#### **Zoom Account and App:**

Due to the online nature of this year's delivery, lectures will be carried out on zoom and practicals on Bb Collaborate. You should sign in to your UofT Zoom account when entering the virtual class. It is strongly recommended that you download the latest version of the Zoom App supported by your operating system. Doing this will allow you to participate in the in class polls more easily without issue.

## 5 Activities and Grading

### Grade Components

#### **Pre-lecture Reading Quizzes (5%)**

Before each Tuesday lecture, on the course website 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 to prepare for the lectures and reading quizzes.

#### **Post-lecture Quizzes (5%)**

Deployed through the WileyPLUS system, these assignments will be a weekly set of questions based on the textbook reading material and lecture discussions of the week just ending. Each homework is worth 5 points, and you will need to score 50 out of a total of 55 in order to get full marks on post-lecture quizzes. A mix of conceptual questions and applied problem-solving exercises will be included. Do not spend more than two hours on each homework.

#### **Practical Worksheets (10%)**

Every week (starting in Week 2), you will attend a practical session led by a TA. In these two-hour weekly sessions you will work in groups to discuss examples on the concepts introduced in your textbook readings and lecture presentations. Groups will apply these concepts and principles, in order to develop skills useful in scientific conceptual analysis and general problem-solving. You will be provided with worksheets which you will work on in group and with your TA and peers. Worksheets will be individually submitted. They will be available at 11:59 pm the day before the practical and are always due 11:59 pm Toronto time on the day of the practical.

#### **Lab Reports (10%)**

For 3 of the 11 weeks, instead of practical activities, you will have 3 labs. These will occur on week 4 (June 2nd), week 8 (July 7th) and week 9 (July 14th). The labs will be done synchronously with the TAs in groups, and the submissions will be individual and due 11:59 pm Toronto time on the day of the practical. You may choose not to attend without penalty, but you will have to complete the lab without synchronous TA support/help or peer discussion.

#### **Test (15%)**

The test will be scheduled tentatively during Week 6 and it will be 2 hours long. This test will feature the material from the lectures and textbook readings up to and including the discussions of Week 5.

#### **Problem sets (20%)**

There will be two problem sets, one in week 4 and one in week 10. Each will be due one week later.

#### **Final Exam (35%)**

The final Exam will be announced through the department. It will include material from lectures, practicals and the textbook.

## Grades Summary

Pre-lecture/ Post-Lecture Quizzes	10%
Practical Worksheets/Lab Reports	20 %
Test	15 %
Problem Sets	20 %
Final Exam	35 %

**All work is to be submitted individually**

### Example week workload (beginning at week 2)

Monday	Read relevant chapter and do pre-lecture quiz (max 1.5 hours)
Tuesday	Lecture (2 hours)
Wednesday	Practical or lab (2 hours)
Thursday	Lecture (1 hour)
Friday	Post-lecture Quiz (max 1 hour)

There will also be problem sets/tests which will incur more work during some weeks

### Lateness Policy

Except for the test and final which must be taken on the date on which they are planned, all other assessments have a **10%/day** lateness penalty. You can be except from this if you inform the instructors of a medical or serious personal/academic reasons **before** the due date.

## 6 Online Classroom and Quercus etiquette

- Class starts at 10:10 pm, and ends at 12:00 pm on Tuesday and 11:10 am and ends at 12:00 pm on Thursday.
- Microphones must be muted unless asking or answering a question. You are encouraged to interrupt as much as you want (either by using the raise hand feature or by simply turning on your mic and talking) as long as you have questions relevant to the course content.
- You are strongly encouraged to have your video on. While this is not mandatory, it fosters a more personal teaching environment for the instructors and generates a much-needed sense of community.
- Similarly, adding a profile pic to your quercus page is a nice thing to do, but not a requirement.
- Be kind to yourself and others. It's obvious that no discriminatory behaviours of any type will be tolerated. Moreover, being understanding of each other can go a long way to help out everyone's learning process.

## 7 Course and relevant University Policy

### Name and Student Number

Any work you hand in must clearly indicate your name and student number. This includes practical activities, lab reports, tests, and the final exam.

### E-mail/Quercus Messaging

If you want to ask a question via email, please first check the various threads in the Discussions section 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 email. This way you will also help other students facing the same issue. These discussions are monitored regularly by the course instructor and your peers, making it the best way of communicating for various queries of a diverse nature. However, if these electronic forums are not the best place for your query, make sure you send your email from an official utoronto.ca address (e.g., your UTmail+ account), as all other addresses will be filtered out automatically. For a quicker response time include the code PHYA21 in the subject line of your message. Emails

will be answered within one business day, so it's best not to leave important questions for last minute as there may not be enough time for you to get an answer and properly digest it.

### **Absences**

In order to ensure fairness in the assessment of all students, synchronous assessments have been kept to the absolute minimum, namely one test and the final exam. In the case of a health, academic or personal problem that supports an absence to the test, there will be a make-up date/time for the test. Please, make sure to inform the instructor as soon as you are able to. If the problem is health-related you must use the official form available here on the Registrar's Website.

### **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: <https://governingcouncil.utoronto.ca/media/15068/view> 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 <https://www.uts.utoronto.ca/vpdean/academic-integrity>).

## **8 Course Support**

### **Discussions Section**

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 Discussions on a regular basis to keep on top of current issues. Lecturecasts and Lecture Notes Videos of the lecture discussions will be available after each session and will remain accessible for one week. These videos are not meant to replace your participation in the lecture discussions. They are provided to help you review difficult material in preparation for other course components. The slides from the lectures will be made available on the course website after each lecture. To prepare for a lecture you should read the assigned textbook materials.

### **Facilitated Study Groups (FSG)**

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! **Physics Study Centre (PSC)** 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 volunteer students will be available to offer help with Physics questions and problems. The schedule will be posted at: <http://www.myepsa.ca/tutoring/physics-centre/>

### **AccessAbility**

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disabil-

ity/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. I will work with you and AccessAbility Services to ensure you can achieve your learning goals in this course. **Enquiries are confidential.** The UTSC AccessAbility Services staff (<https://www.utsc.utoronto.ca/ability/welcome-accessability-services>) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or [ability@utsc.utoronto.ca](mailto:ability@utsc.utoronto.ca)

## 9 Course Schedule

### Weekly Schedule

Week 1 May 11th and 13th	Intro to the course and Intro to Waves <b>Wave Speed, Wave Interference, Standing Waves</b> Chapters: 16.1,16.2,16.5,16.7
Week 2 May 18th and 20th	Waves Examples and Measurement <b>Sound Waves, Intensity &amp; Instruments</b> Chapters: 17.1-17.7
Week 3 May 25th and 27th	Electrostatics and Intro to Field Theory <b>Electric Charge and Coulomb Force, Field Model, Fields of point charges</b> Chapters: 21.1-21.3, 22.1-22.3
Week 4 June 1st and 3rd	Charge Distributions and Coulomb Law applications <b>Continuous Charge distributions, Motion in Electric Fields, Electric Potentials</b> Chapters: 22.4-22.7, 24.1,24.2
Week 5 June 8th and 10th	Potentials and energy <b>Potentials of Point and continuous Charges, Potentials and Energy</b> Chapters: 24.3-24.8
Week 6 June 15th and 17th	Capacitors and Currents <b>Capacitance and Dielectrics, Electric Current and Ohm's Law</b> Chapters: 25.1-25.5, 26.1-26.5
<b>Reading Week!</b> June 22nd and 24th No Lecture or Practicals!	<b>Reading Week!</b>
Week 7 June 29th (no Thursday lecture on Canada Day)	Circuits <b>Circuit Laws, Resistors, RC Circuits</b> Chapters: 27.1-27.4
Week 8 July 6th and July 8th	Intro to Magnetism <b>Magnetic Force Law, Magnetism and Currents</b> Chapters: 28.1-28.8, 29.1-29.5
Week 9 July 13th and July 15th	Induction and EM Waves <b>Lenz &amp; Faraday Law, Induced Fields</b> Chapters: 30.1-30.4, 33.1
Week 10 July 20th and July 22th	EM Waves, Interference and diffraction <b>EM Waves, Interference, Diffraction</b> Chapters: 33.1, 35.1-35.3, 36.1-36.3
Week 11 July 27th and July 29th	Intro to Special Relativity <b>Simultaneity, Lorentz transformations, Addition of velocities</b> Chapters: 37.1-37.4
Week 12 August 3rd and August 5th	Doppler Effect and Relativistic Energy <b>EM Waves, Interference, Diffraction</b> Chapters: 33.1, 35.1-35.3, 36.1-36.3
Week 13 August 10th	Review (or Makeup if required)

## 10 Acknowledgement

I would like to thank Dr. Johann Bayer whose syllabus this syllabus is based on. I would also like to thank the folks at the CI training program for all the training and feedback.