

# PHYS 122: General Physics II: Electricity and Magnetism

## SYLLABUS AND COURSE CALENDAR

17 January 2018

$$\oint \mathbf{E} \cdot d\mathbf{A} = q / \epsilon_0$$

$$\oint \mathbf{B} \cdot d\mathbf{A} = 0$$

$$\oint \mathbf{E} \cdot d\mathbf{S} = -d\Phi_{\mathbf{B}} / dt$$

$$\oint \mathbf{B} \cdot d\mathbf{S} = \mu_0 i + \mu_0 \epsilon_0 d\Phi_{\mathbf{E}} / dt$$

### Syllabus and Summary Information:

<b>Content:</b>	<b>Calculus-based Introductory Electromagnetism:</b> Electric charge, electric fields, superposition, Gauss' Law surface integrals, electric flux, the electric potential, simple circuits, Ohm's Law, magnetic fields, Ampere's Law, electromagnetic induction, capacitors, inductors, fields in materials, time-variable circuits, AC circuits, electromagnetic waves, optics, interference.
<b>Prerequisites:</b>	PHYS 121 (Mechanics) or equivalent <i>and</i> MATH 122 (Calculus II) concurrent or equivalent
<b>Schedule:</b>	Lectures: M W F 9:30 to 10:20 AM in Strosacker Auditorium, Case Quad Labs: every other week as scheduled. First Lab: Wednesday, Jan 17
<b>Instructor:</b>	Corbin Covault, Rockefeller 207 (2nd floor) Phone: 216-368-4006 (office) or 216-339-3861 (mobile) E-mail: cec8@cwru.edu
<b>Office Hours:</b>	Typically: Mon 1PM-4PM, Thu 1PM-4PM, Fri 2PM-4PM, Rock 207
<b>Co-Instructor:</b>	Dr. Peter Kernan, Office: E-mail: pjk6@case.edu
<b>SI Leaders:</b>	Ross Kaufhold (rtk36@case.edu) and Heather Feng (heather.feng@case.edu)

**Syllabus and Summary Information Continued:**

**Course Web Page:** <http://www.phys.cwru.edu/courses/p122>

**Lab Web Page:** <http://physicslabs.phys.cwru.edu/EM/122>

**Phorum Board:** <http://www.phys.cwru.edu/forums/list.php?96>

**Recommended Texts:** *Physics for Engineers & Scientists, V2, 3Ed.* by Ohanian & Markert ISBN: 978-0393930047  
*The Cartoon Guide to Physics* by Gonick and Huffman ISBN: 978-0062731005

**Very Recommended:** *i>Clicker+ student remote* ISBN: 978-1464120152

**Required for Online Homework:** *The Expert TA*, software license: Class Code: **USW37OH-AB841E-1P5** register at: <https://www.theexpertta.com/registration/>

**Required for Lab:** *Intro Electromagnetism Lab Manual* and a Lab Notebook (available in bookstore)

**Homework:** Worth **15%** of your grade, assigned weekly as follows:

**2% = Pre-Lecture Homework** usually due Wednesdays, 11 AM via *Canvas*.

**3% = Online Homework** usually due Fridays, 11 PM via *The Expert TA*.

**10% = Written Homework** usually due Mondays, 5 PM *outside Rock 207*.

Written Homework solutions by instructor, will be posted online.

Eleven weekly homework assignments, lowest score will be dropped.

*No late homework will be accepted under any circumstances.*

<b>Grade Breakdown:</b>	Homework	15% (11 homeworks, lowest score is dropped)
	1st hour exam (Fri Feb 09)	5%
	2nd hour exam (Fri Mar 02)	10%
	3rd hour exam (Fri Apr 06)	10%
	Laboratory	25%
	Final exam (Tue May 8, 3:30PM)	35%

**Bonus Points:** *Entirely Optional:* Up to 5% extra points for clicker participation

## PHYS 122 Fall 2018 Course Schedule:

Here is an *approximate* schedule for the course (subject to modification in the weekly reading and homework assignment). For this table, I count fifteen weeks in the class and label each week by the date of the Monday on that week. Note that all Hour Exams will be held on Fridays. **Important: the dates indicated for the Hour Exams and the Final Exam are fixed.** Also dates where no class will be held are so indicated:

	Wk	Mon Date	Homework Due?	Content Topics	Important Dates
Cycle 1	1	Jan 15	none	Charges, Fields, Voltage	<b>No Classes: Mon Jan 15</b>
	2	Jan 22*	HW#01*	Circuits	
	3	Jan 29	HW#02	Magnetism, Faraday's Law	<b>Hour Exam: Feb 09</b>
	4	Feb 05	HW#03	E-M Waves	
Cycle 2	5	Feb 12	none <sup>†</sup>	Gauss' Law	<b>Hour Exam: Mar 02</b>
	6	Feb 19	HW#04	Ampere's Law, B-fields	
	7	Feb 26	HW#05	Waves, Interference	
Cycle 3	8	Mar 05	none <sup>†</sup>	Fields and Energy	<b>Mar 12-16 No Labs, No Classes</b>
		Mar 12	HW#06 <sup>‡</sup>	<b>SPRING BREAK</b>	
	9	Mar 19	HW#07	Conductors, etc.	
	10	Mar 26	HW#08	Capacitor, Inductors	
	11	Apr 02	HW#09	Faraday, Lenz	
Cycle 4	12	Apr 09	none <sup>†</sup>	Maxwell's Equations	<b>Reading Days May 1,2</b>
	13	Apr 16	HW#10	EM Waves, Optics	
	14	Apr 23*	HW#11*	Quantum Theory	
	15	May 01	none <sup>†</sup>	<b>Apr 30 last day of class</b>	
		Tues	May 08	<b>Final Exam</b>	<b>3:30 to 6:30 PM Tue May 08**</b>

\* Homeworks #01 and #11 will be Written Only (no pre-lecture or online homework).

<sup>†</sup> For weeks with no homework due, Optional Practice Problems will be offered.

<sup>‡</sup> Homework #06 is a special assignment, and can be submitted any time before Wed, March 21, 2018.

\*\* All students **must** sit for the final exam to earn a passing grade.

## PHYS 122: Anticipated Typical Weekly Workload:

At CWRU the “rule of thumb” is that a four credit hour course should correspond to a total average weekly time commitment of about 12 to 16 hours per week. Here's how this breaks down for Physics 122:

Hours per Week	Weekly PHYS 122 Activities:
3	In-class lecture hours
1	Pre-lecture Readings and Video Clip Homework
1	Online Homework
4	Written Homework
3	Labs: ( <i>either</i> in-lab <i>or</i> prep and lab reports)
(4)	Optional: additional practice, study, office hours, SI sessions)
<b>12 to 16</b>	<b>Total Average Hours per week workload</b>

## PHYS 122: Goals and Philosophy of the Course:

The main goals for for Physics 122 General Physics I: Mechanics are:

- To have students **understand** the formal method of investigating the world through the physical sciences, and in particular, to have students learn for themselves how physics as a discipline can be used to obtain a deep understanding of how the world really works and how that knowledge can be used to make predictions and solve problems.
- To have students **understand** the central concepts of electric charge, electric current, and electric and magnetic fields,
- To have students **understand** how charges and currents *respond* to electric and magnetic fields and also how charges and current *generate* electric and magnetic fields,
- To have students **understand** practical fundamentals of linear electric circuit components and how their operation is governed by the fundamental laws of electricity and magnetism both in static and time-varying scenarios,
- To have students **understand** how all of the individual laws and observations regarding electricity and magnetism were unified by Maxwell into a theoretical framework and that this framework also precisely describes visible light and all other forms of electromagnetic radiation, and
- To have students **demonstrate** their mastery of all of the above listed understandings by successfully **applying** physics concepts toward **solving a broad range of problems** – including conceptual and technical problems, both familiar and unfamiliar – with clarity, precision, logical coherence, and mathematical sophistication.
- To have student **explain** their own problem-solving work correctly, clearly, and completely, further demonstrating the breadth and depth of their understanding.