

## University of Houston-Downtown

**Course Prefix, Number, and Title:** PHYS 2402: Physics II

**Credits/Lecture/Lab Hours:** 4/4/0

**Foundational Component Area:** Life and Physical Sciences

**Prerequisites:** Grade of C or better in PHYS 2401 and credit or enrollment in PHYS 2102.

**Co-requisites:** None

**Course Description:** This is the second in a two-part survey of physics for science majors using calculus. Topics include electric charge, electric fields and potentials, Gauss' Law, capacitors and dielectrics, AC and DC electrical circuits, magnetic fields, the Biot-Savart Law, Faraday's Law, magnetic properties of matter, Maxwell's equations and electromagnetic waves and optics. Credit for both PHYS 1308 and PHYS 2402 may not be applied toward a degree.

**TCCNS Number:** PHYS 2426

**Demonstration of Core Objectives within the Course:**

Assigned Core Objective	Learning Outcome Students will be able to:	Instructional strategy or content used to achieve the outcome	Method by which students' mastery of this outcome will be evaluated
Critical Thinking  Empirical & Quantitative Reasoning	Utilize scientific processes to identify questions pertaining to natural phenomena.	Lecture presentations and problem-based lab activities focus on theories in physics and on the historical and mathematical development of Physics. The question "Why?" is prominent in both lecture and lab.  All theoretical discussion is based on Calculus. Topics discussed include the Electric Fields, Electric Potential and Currents; Magnetic Fields, Inductance and Electromagnetic Waves; Light and Optics.	Students must solve real-world problems by combining experimental observation and hypothesis development. Students must identify the correct question and devise the correct approach to answer the question.  Students will be subjected to examination in which they have to solve numerous problems covering all material discussed and demonstrating command of <b>Calculus</b> . The exams will be graded for approach to solving the problem and scientific accuracy.
Critical Thinking  Empirical & Quantitative Reasoning	Utilize scientific processes to develop hypotheses, collect and analyze data using quantitative and qualitative measures.	Students must perform experiments in lab, make observations, collect data, calculate results, and generate graphs, in the co-requisite 2101 laboratory, on topics of: Ohm's Law, Kirchoff's Rules,	Students are given hands-on lab practical exams where they must arrange an apparatus, perform experiments, collect data, and calculate results. These experiments involve changes from what the student has

		Circuits, Geometric Optics, Wave Optics, Lenses, Mirror, and Optical Devices, Diffraction and Interference.	practiced so that the student must reason through a new set up to obtain the required results. Students will be assessed on their ability to recognize and correctly use the appropriate formula and draw correct conclusions.
Critical Thinking Empirical & Quantitative Reasoning Communication	Utilize scientific processes to effectively communicate the analysis and results using written, oral and visual communication.	Students must record procedures, data, and observations in a bound notebook during lab. Student must perform the required analysis and generate multiple graphs to present the results in a convincing manner. All work must be documented in typed laboratory reports which are written according to publication standards. Students are often approached during lab and asked to make a defense of their procedures (whether right or wrong) and their calculations. Students are expected to understand the experiments and are given concepts and ideas to work with instead of written procedures and recipes. Once in semester each student will be required to give <b>oral/visual presentation</b> in the lab on topic covered. Presentations will be evaluated for quality of communication and scientific accuracy using a rubric	Typed laboratory reports are collected on a weekly basis and graded for content, style, and correct analysis. Written lab reports will be evaluated for both scientific accuracy and quality of written communication using a rubric. <b>Oral/visual presentations</b> will also be evaluated for quality of communication and scientific accuracy using a rubric.
Teamwork	Collaborate in the evaluation of the quality of scientific evidence from multiple perspectives toward the goal of reaching a shared objective.	In each lab session student teams must perform experiments together with one specified piece of equipment. Students will work together to test equations by comparing observed and expected values.	All students are asked to submit a copy of their data before leaving the lab. If there is a problem with the data, students are asked to repeat the experiment or re-analyze their data. Successful completion of the experiment is part of the lab grade. A portion of the student's grade will be based on the group completion of data tables.

**Additional Course Outcomes:**

Lecture: N/A

Lab: N/A

**Course Outline:**

Lecture:

- Electric Fields and Gauss Law,
- Electric Potential
- Capacitance and Dielectrics
- Current and Resistance
- DC Circuits
- Magnetic Fields
- Sources of the Magnetic Field
- Faraday’s Law
- Inductance AC Circuits
- Electromagnetic Waves
- Principles of Ray Optics
- Image Formation
- Wave Optics
- Diffraction Patterns and Polarization.

Lab:

- Introduction to DC Circuits
- Equipotential Plots
- Kirchhoff's Rules
- RC Circuit Time Constant
- Electron Deflection Tube
- Frequency Dependence of R, L, and C
- RLC Series Circuit
- Induction, Oscilloscope, and RL Circuit
- Microwave I. Geometric Optics
- Microwave II. Wave Optics
- Lenses, Mirror, and Optical Devices
- Diffraction

**Lecture: Grading/Course Content which Demonstrates Student Achievement of Core Objectives:**

**Course Grade                      A: 90-100                      B: 80-89                      C: 70-79                      D: 60-69                      F: 0-59**

<b>Summary of Course Exams, Quizzes, Activities, and Final</b>	
Partial Exams	60%
Final Exam	40%
Total	100%

**Lab: Grading/Course Content which Demonstrates Student Achievement of Core Objectives:**

**Course Grade**            **A: 90-100**        **B: 80-89**            **C: 70-79**            **D: 60-69**            **F: 0-59**

<b>Summary of Course Exams, Quizzes, Activities, and Final</b>	
Lab and Related Report (7pts each/12 labs total) One lab report will be an oral presentation	84pts
Exams (14 pts each/2 exams total)	28 pts
Total	112 pts