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1. **College:** Sciences and Mathematics
2. **Department:** Physics and Astronomy
3. **Course Status:** Existing
4. **Course Prefix and Number:** PHY 110
5. **Course Title:** Fundamentals of Electronics
6. **Course catalog description:** Introductory study of fundamental electrical circuits, including DC and AC circuits, filter networks, amplifiers, diodes, transistors, and logic gates. Lecture and laboratory grades are computed into one grade and the same grade is recorded for both lecture and lab. Co-requisite: PHY 110L.
7. **Number of semester credit hours:** 3
8. **Estimated enrollment per year:** 65
9. **Course prerequisites:** TSI complete **Corequisite:** PHY 110 laboratory
10. **Course is <u>not</u> available online**
11. **Foundational Component Area:** Life and Physical Sciences
12. **Explain why this course fits into this foundation component area:** Electronics is a branch of physics and technology concerned with the design of analog and digital circuits. Electronics revolutionized human society 150 years ago and continues to be a vital part of modern technology. This course shows how the natural phenomenon of electricity can be harnessed and used to enhance the human experience. Students will be introduced to concepts such as voltage, current, resistance, and electrical power. They will learn how to analyze and design alternating current and direct current (AC and DC) circuits that are used in common everyday electrical devices. The scientific method is used throughout. The laboratory work augments the theory covered in the lecture. The laboratory exercises give students hands-on experience with power systems, common circuit components, circuit prototyping, and diagnostic equipment. Topics include DC and AC circuits, resistors, capacitors, inductors, filter networks, amplifiers, diodes, transformers, transistors, oscilloscopes, function generators, power supplies, and logic gates.
13. **Core Objectives**

    - **Critical Thinking** - In the lecture part of this course, students will be instructed on the elements of critical thinking that will improve their ability to describe, explain, and predict electrical phenomena using the scientific method. This instruction will be early in

the semester and will take place through assigned readings and instructor led lectures that include discussions with the class. Mastery of critical thinking skills will be demonstrated in **The Ohm's Law Project**. This project is an experiment in the co-requisite lab, but unlike other experiments performed during the semester, students will be given two weeks to submit a formal, detailed write-up. In order to complete this assignment, students must take the principles learned in the lecture and synthesize them into the actual construction of a working circuit. Guidelines are provided, but it is up to the student to analyze circuit schematics and construct a working circuit. After constructing the circuit, the students will collect the relevant data (e.g. voltage, current, etc.), and draw conclusions (evaluation and synthesis) from the results.

- **Communication Skills**- In the lecture portion of this course, students will be taught communication skills which will include effective development, interpretation, and expression of ideas through written and visual communications. Lectures and instructor led class discussions will be used to accomplish this. Instructors will also provide instruction on the correct construction and interpretation of visual displays of data such as charts and graphs. Written and visual communication skills will be assessed in **The Ohm's Law Project**. The formal lab write-up associated with this project will require each student to write results and draw conclusions (written communications) based on data tables and graphs (visual) produced in the exercise.
- **Empirical and Quantitative Skills**- Data analysis is a crucial part of the scientific method. In the co-requisite lab course students will be taught how to correctly collect and analyze scientific data. Their empirical and quantitative skills will improve with each experiment. They will learn how to make accurate measurements, do necessary calculations, and perform error analyses. Mastery of these skills will be demonstrated in **The Ohm's Law Project.** The project requires measurement of electrical properties of a circuit and calculations to reach insight and understanding. This work commonly includes creating and interpreting graphs. Students will have two weeks to complete a formal write-up of an experiment. This will require use of a word processor and spreadsheet.
- **Teamwork**- Students will be taught the essentials of good teamwork in the lecture portion of this course, where the instructor will use lecture, assigned reading, and class discussions to help students form the ability to consider different points of view and to work effectively with others. This course has a co-requisite lab requirement that will be a vital part of this objective. Students work in groups of 2 or 3 in the electronics lab. Mastery of teamwork will be demonstrated in **The Ohm's Law Project.** The teams must work together to successfully construct circuits for each lab exercise. Students play the role of circuit constructor, schematic interpreter, and troubleshooter as part of a team during the lab portion of the course. Students will critique the teamwork experience with peer evaluations using a multiple choice Likert Scale Questionnaire, and the teamwork experience as a whole by responding to short answer questions. The team evaluation rubric that is used evaluates students on the following skills: questioning, participating,

listening, helping, persuading, respecting, and sharing. (The take-home part of this project will involve individual, not teamwork, efforts to plot and analyze the data and to draw conclusions.)

Contact person for questions about this submission:

a. Harry Downing
b. 2290
c. hdowning@sfasu.edu