PHYSICS DEPARTMENT
COURSE OUTLINE

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PHYS 214   SCIENCE LABORATORY ELECTRONICS

An introduction to laboratory electronics and instrumentation. Topics: DC circuits, AC circuits, solid state devices, integrated circuits, digital circuits.

OFFERED:	Fall
CREDIT:	4
IN-CLASS WORKLOAD:	3 lecture, 3 lab (semester)
PREREQUISITES:	PHYS 115 and MATH 100

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REQUIRED MATERIALS

A tool kit is required and supplied by the Physics Department. A $50 deposit will be refunded when the kit is returned in good condition at the end of the course.

Textbook: Physics for Scientists & Engineers with Modern Physics, 6th edition, Serway, R.A. and Jewett, J.W.Jr.

Reference: Introductory Electronics for Scientists and Engineers, 2nd edition, Simpson, R. (on reserve in the library).
P214 lab manual
Hardcover laboratory notebook

DEPARTMENT POLICIES REGARDING TESTING

1. Students must write quizzes, tests, midterm tests, etc., on the date and time assigned by the instructor. Instructors are not required to provide make-up tests. At their discretion, instructors may waive a test or provide a make-up test only in the event of documented illness or other extenuating circumstances.

2. Midterm tests may be dropped if: (a) a first-class mark is obtained on the comprehensive final exam, and (b) all term work has been completed and is judged to be satisfactory. In this case, the final grade for the course may be based on a combination of the final exam and the lab mark.

DEPARTMENT POLICIES REGARDING LABS

1. All assigned laboratory exercises and reports must be completed with an overall grade of 60% in order to obtain credit for this course. A lab may be waived or made up at a later time only in the case of documented illness or other extenuating circumstances.

2. A student who is repeating a Physics course does not have to complete the laboratory exercises a second time if an average lab grade of 70% or better was obtained.

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STUDY TIME

It is recommended that between 5 and 10 hours per week (or more for students with a weak background) be spent studying for this course outside of class time.

GRADING

The standard mark distribution for this course is as follows:

Final Exam	50%
Midterms and other work	30%
Lab Reports	20%
	100%

    This distribution may be amended by the instructor (see your Instructor's Information sheet).

GRADE SCALE

Final letter grades are normally assigned as follows (subject to above conditions):

Percentage	Letter Grade
95 to 100	A+
90 to 94	A
85 to 89	A-
80 to 84	B+
75 to 79	B
70 to 74	B-
65 to 69	C+
60 to 64	C
50 to 59	D
below 50	F

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<u>OUTLINE</u>

1. **<u>Review</u>**

    1.1 Properties of Electric Charges
    1.2 Insulators and Conductors
    1.3 Coulomb's Law
    1.4 The Electric Field
    1.5 Potential Difference and Electric Potential
    1.6 Electric Current
    1.7 Resistance and Ohm's Law
    1.8 Resistance and Temperature
    1.9 Superconductors
    1.10 Electrical Conduction
    1.11 Electrical Energy and Power.

2. **<u>Circuits</u>**

    2.1 Resistors in Series and Parallel
    2.2 Kirchhoff's rules
    2.3 Superposition Theorem
    2.4 Thevenin's andNorton's Theorems
    2.5 Voltage and Current Dividers.

3. **<u>Capacitors</u>**

    3.1 Capacitance
    3.2 Charging and Discharging a Capacitor in a series RC circuit
    3.3 Series and Parallel Combinations of Capacitors
    3.4 Energy Stored in a Capacitor.

4. **<u>The Magnetic Field</u>**

    4.1 Properties of the Magnetic field
    4.2 Magnetic Flux
    4.3 Faraday's Law of Induction
    4.4 Self Inductance
    4.5 Series RL Circuit.

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5. **RC, RL and RCL Circuits**

5.1 A.C. Waveforms
5.2 Phasor Diagrams
5.3 Series RC, RL and RLC Circuits
5.4 Average and R.M.S. Values
5.5 Transformers and Applications of Transformers.

6. **Atomic Theory**

6.1 Review of Atomic theory
6.2 Bohr Atom

7. **Semiconductors**

7.1 Bonding in Solids
7.2 Band Theory of Solids
7.3 Electrical Conduction in Metals
7.4 Insulators and Semiconductors
7.5 Doped Semiconductors
7.6 The p-n Junction and Junction Transistor
7.7 The Integrated Circuit.

8. **Functions and Gates**

8.1 The Operational Amplifier
8.2 Basic Logic Functions and Gates
8.3 Flip-Flops.