

**PALOMAR COLLEGE**  
**COURSE OUTLINE OF RECORD FOR**  
**DEGREE CREDIT COURSE**

  X   Transfer Course     X   A.A. Degree applicable course  
(check all that apply)

**COURSE NUMBER AND TITLE:** ECHT 100 Electronic Components and Circuits

**UNIT VALUE:** 4.5

**MINIMUM NUMBER OF SEMESTER HOURS:** 96

**BASIC SKILLS REQUIREMENTS:**     Appropriate language and computational skills.

**ENTRANCE REQUIREMENTS:**

**PREREQUISITE:** None

**COREQUISITE:** None

**RECOMMENDED PREPARATION:**     None

**SCOPE OF COURSE:**

Fundamentals of DC and AC: Ohm's Law, Kirchoff's Laws, Thevenin's Theorem, magnetism, transformers, capacitance, inductance, and tuned circuits. Laboratory covers application of theory, use of test equipment, circuit design, construction techniques and troubleshooting carried out through traditional workstation procedures and by the computer simulation programs.

**SPECIFIC COURSE OBJECTIVES:**

Successful students will be able to:

1.     Apply principles of scientific notation, prefix conversion, and basic algebraic manipulation applied to electronic properties.
2.     Solve basic electronic problems involving current, voltage resistance, and power (Ohm's Law).
3.     Compare and contrast the relationship between electricity and magnetism.
4.     Use a schematic diagram to construct DC and AC circuits with components such as resistors, relays, switches, lamps, batteries, inductors, capacitors, transformers, and diodes.
5.     Demonstrate the safe, effective operation of measuring and testing equipment.
6.     Analyze the phase relationship for resistive, capacitive, inductive, and resonant tuned circuits.
7.     Apply the resistor color code.
8.     Draw and read basic schematic circuits.
9.     Construct DC and AC circuits with components such as resistors, relays, switches, lamps, batteries, power supplies, capacitors, inductors, and diodes following traditional lab station procedures, using standard equipment, as well as through computer simulated construction, design, and analysis.
10.    Demonstrate basic safety procedures designed to protect the students, components, and equipment.

11. Apply developed troubleshooting techniques and computer simulated programs.

## **CONTENT IN TERMS OF SPECIFIC BODY OF KNOWLEDGE:**

- I. Introduction to Electronics
  - A. History of Electricity and Electronics
  - B. Careers in Electronics
  - C. Applications of Electricity and Electronics
  - D. Circuit Components and Measuring Instruments
  - E. Electrical Units
  - F. Scientific Notation
  - G. Metric Prefixes
- II. Basic Electrical Quantities
  - A. Atoms
  - B. Electrical Charge
  - C. Voltage
  - D. Current
  - E. Resistance
  - F. The Electric Circuit
  - G. Basic Circuit Measurements
- III. Ohm's Law and Power
  - A. Demonstration of Ohm's Law
  - B. Application of Ohm's Law
  - C. Power and Energy
  - D. Power in an Electric Circuit
  - E. The Power Rating of Resistors
- IV. Series Circuits
  - A. Resistors in Series
  - B. Current in Series Circuits
  - C. Total Series Resistance
  - D. Ohm's Law in Series Circuits
  - E. Voltage Source n Series
  - F. Kirchoff's Voltage Law
  - G. Voltage Dividers
  - H. Power in Series Circuits
  - I. Troubles in Series Circuits
- V. Parallel Circuits
  - A. Resistors in Parallel Circuits
  - B. Voltage in Parallel Circuits
  - C. Kirchoff's Current Law
  - D. Total Parallel Resistance
  - E. Ohm's Law in Parallel Circuits
  - F. The Current Divider Principle
  - G. Power in Parallel Circuits
  - H. How Parallel Circuits are Used
  - I. Troubles in Parallel Circuits
- VI. Series-Parallel Circuits
  - A. Identifying Series-Parallel Relationships
  - B. Analysis of Series-Parallel Circuits
  - C. Circuit Ground
  - D. Loaded Voltage Dividers

- E. The Wheatstone Bridge
- F. Circuits with More than One Voltage Source
- G. Thevenin's Theorem
- H. Troubles in Series-Parallel Circuits
- VII. Circuit Theorems and Conversions
  - A. The Voltage Source
  - B. The Current Source
  - C. Source Conversions
  - D. The Superposition Theorem
  - E. Thevenin's Theorem
  - F. Maximum Power Transfer Theorem
- VIII. Magnetism and Electromagnetism
  - A. The Magnetic Field
  - B. Electromagnetism
  - C. Electromagnetic Induction
  - D. Applications of Electromagnetic Induction
- IX. Measuring Instruments (including scope)
  - A. Analog Meter Movements
  - B. Basic Analog DC Meter Circuitry
  - C. Reading Analog Multimeters
  - D. Digital Multimeters (DMMs)
  - E. The Oscilloscope
- X. Time/Angle Domain
  - A. The Sine Wave
  - B. Voltage and Current Values of a Sine Wave
  - C. Sine Wave Voltage Sources
  - D. Angular Relationships of a Sine Wave
  - E. The Sine Wave Equation
  - F. Introduction to Phasors
  - G. Nonsinusoidal Waveforms
- XI. Capacitors
  - A. The Capacitor
  - B. Types of Capacitors
  - C. Series Capacitors
  - D. Parallel Capacitors
  - E. Capacitors in DC Circuits
  - F. Capacitors in AC Circuits
  - G. Capacitor Applications
  - H. Testing Capacitors
- XII. Inductors
  - A. The Inductor
  - B. Types of Inductors
  - C. Series Inductors
  - D. Parallel Inductors
  - E. Inductors in DC Circuits
  - F. Inductors in AC Circuits
  - G. Inductor Applications
  - H. Testing Inductors
- XIII. Transformers
  - A. The Basic Transformer

- B. Step-up Transformers
  - C. Step-down Transformers
  - D. Transformer Power
  - E. Reflected Load in Transformers
  - F. The Transformer as an Isolation Device
  - G. Non-Ideal Transformer Characteristics
  - H. Other Types of Transformers
  - I. Troubles in Transformers
- XIV. Frequency Response of RL Circuits
- A. Sinusoidal Response of RL Circuits
  - B. Impedance and Phase Angle of Series RL Circuits
  - C. Analysis of Series RL Circuits
  - D. Impedance and Phase Angle of Parallel RL Circuits
  - E. Analysis of Parallel RL Circuits
  - F. Series-Parallel Analysis
  - G. Power in RL Circuits
  - H. Basic Applications of RL Circuits
- XV. Frequency Response of RC Circuits
- A. Sinusoidal Response of RC Circuits
  - B. Impedance and Phase Angle of Series RC Circuits
  - C. Analysis of Series RC Circuits
  - D. Impedance and Phase Angle of Parallel RC Circuits
  - E. Analysis of Parallel RC Circuits
  - F. Series-Parallel Analysis
  - G. Power in RC Circuits
  - H. Basic Applications of RC Circuits
- XVI. Resonance
- A. Impedance and Phase Angle of Series RLC Circuits
  - B. Analysis of Series RLC Circuits
  - C. Series Resonance
  - D. Series Resonant Filters
  - E. Parallel RLC Circuits
  - F. Parallel Resonance
  - G. Parallel Resonant Filters
  - H. System Applications

### **REQUIRED READING:**

Cook, Nigel P. Introductory DC/AC Circuits. 5<sup>th</sup> ed. Upper Saddle River, NJ: Prentice Hall Publishing Company, 2002.

Stanley, Brian H. Experiments in Electric Circuits. 6<sup>th</sup> ed. Columbus, OH: Merrill Publishing Company, 2000.

### **SUGGESTED READING:**

Berlin, Howard M. The Illustrated Electronics Dictionary. Columbus, OH: Merrill Publishing Company, 1986.

Meade, Russell M. Foundations of Electronics. 3<sup>rd</sup> ed. Albany, NY: Delmar Publishers, 1999.

Floyd, Thomas L. Electronics Fundamentals; Circuits, Devices, and Applications. 5<sup>th</sup> ed. Columbus, OH: Merrill Publishing Company, 1998.

Beitzel, Wallace D., and James H. Harter. Mathematics Applied to Electronics. 3<sup>rd</sup> ed. Englewood Cliffs, NJ: Prentice Hall, 1988.

**REQUIRED WRITING:**

1. Approximately 12 problem solving exercises of approximately one to three paragraphs in length used in evaluation testing.
2. Approximately 16 laboratory reports (writings related to conclusions/discussions of results of experimental findings) of approximately one to three paragraphs in length.

**OUTSIDE ASSIGNMENTS:**

**Students are expected to spend a minimum of three hours per unit per week in class and on outside assignments, prorated for short-term classes.**

Reading assignments are from the text, laboratory manuals, and handouts in preparation for quizzes and tests. Approximately 300 pages in the textbook and 200 pages in the laboratory manuals are required readings for the course. Writings as stated in “Required Writings.”

**INSTRUCTIONAL METHODOLOGY:**

**Check all that apply:**

- lecture
- laboratory
- lecture-laboratory combination
- directed study

**DISTANCE LEARNING:**

**This course may be offered as a distance learning course and meets Title 5 regulations 55370, 55372, 55374, 55376, 55378, and 55380.**

Yes  No

**If yes, check all that apply:**

- Television Course (Video one-way, e.g. ITV, video cassette, etc.)
- Online Course (Text one-way, e.g. newspaper, correspondence, electronic file, etc.)

- Two-Way Video Conferencing (Two-way interactive video and audio)
- One-Way Video Conferencing (One-way interactive video and two-way interactive audio)
- Computer Assisted Instruction (A specialized form of mediated instruction relying primarily on student access to information and prepared lessons or teaching materials through a computer terminal, but not under immediate supervision of a qualified instructor.)

**GRADING POLICY AND STANDARDS** (include methods of determining whether the stated objectives have been met by students):

Quizzes	18%
Homework	18%
Class Tests	30%
Technologist's Notebook	4%
Average of Laboratory Experiments	18%
Formal Lab Report	12%

**IS COURSE REPEATABLE FOR REASON(S) OTHER THAN DEFICIENT GRADE?**

Yes  No  Number of times course may be taken for credit: one

If yes, identify specific provision of Title 5 Division 2 section(s), 55761-55763 and 58161 which qualifies course as repeatable:

**CONTACT PERSON:** George Hershman x2563

**SIGNATURES ON FILE**