Las Positas College
3000 Campus Hill Drive
Livermore, CA 94551-7650
(925) 424-1000
(925) 443-0742 (Fax)

Course Outline for ENGR 50

INTRODUCTION TO ELECTRONIC SYSTEMS AND MEASUREMENTS

Effective: Spring 2020

I. CATALOG DESCRIPTION:
ENGR 50 — INTRODUCTION TO ELECTRONIC SYSTEMS AND MEASUREMENTS — 4.00 units

Introduction to electrical and electronic systems and circuits. Overview of digital and analog electronics, semiconductor devices and software tools. Direct current and alternating current circuit analysis including Ohm's law and Kirchhoff's laws. Measurement and characterization of electronic systems, data collection, and reporting results. Comparing system and component performance to published specifications and developing troubleshooting techniques. Laboratory practice includes operation and proper use of standard test instruments.

2.00 Units Lecture 2.00 Units Lab

Prerequisite
MATH 39 - Trigonometry
with a minimum grade of C

Grading Methods:
Letter Grade

Discipline:
- Engineering

	MIN
Lecture Hours:	36.00
Expected Outside of Class Hours:	72.00
Lab Hours:	108.00
Total Hours:	216.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. MATH39
1. Graph the basic trigonometric functions and apply changes in period, phase and amplitude to generate new graphs;
2. Develop and use trigonometric ratios or other trigonometric formulas to solve problems;
3. Convert between polar and rectangular coordinates and equations;
4. Represent a vector (a quantity with magnitude and direction) in the form <a,b> and ai+bj.

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

A. Demonstrate understanding of the basic electrical concepts of voltage, current, power, efficiency, energy, resistance, impedance, capacitance and inductance;
B. Demonstrate the ability to perform basic D.C. and A.C. circuit analysis using Ohms law and Kirchoff's laws;
C. Describe the function of common semiconductor devices including diodes, bipolar and field-effect transistors, thyristors and operational amplifiers;
D. Demonstrate ability to make common circuit measurements with a multimeter and oscilloscope.
E. Explain meter loading and define precision and accuracy, and calculate accuracy and error;
F. Develop, present, and execute a logical troubleshooting plan appropriate for the subject system or component;

V. CONTENT:
A. Basic electronic and electrical concepts including voltage, current, energy, power, efficiency, resistance, capacitance, inductance and impedance
B. Creating and reading schematics and specification sheets
C. Excel as a data collection and graphic presenation tool
D. Ohm's law and Kirchoff's law in DC (Direct Current) and AC (Alternating Current) circuits
E. Electric and magnetic fields
F. Basic circuit anaysis for DC and AC circuits

G. Overview of digital electronics
H. Diodes, BJT, FET and thyristor devices and circuits
I. Amplifier circuits

VI. LAB CONTENT:
A. Use of Microsoft Excel as a data collection and graphic presentation tool
B. Digital Multimeter (DMM) measurements of DC voltage, current and resistance
C. DMM measureemnts of AC voltage and current.
D. Steady state and transient measurements with the oscilloscope
E. Temporal measurements with the oscilloscope
F. Gain and bandwidth measurements
G. Amplifier characterization
H. Characterization of digital waveforms; logic levels and timing
I. Current/voltage characteristics of linear and non-linear two-terminal devices
J. Developing skills in troublshooting electrical circuits

VII. METHODS OF INSTRUCTION:
A. **Lecture** - Whiteboard and Powerpoint lectures
B. **Classroom Activity** -
C. **Lab** - Six hours of lab per week will emphasize hands-on skills in a variety of electrical circuits.
D. **Observation and Demonstration** -
E. **Projects** -

VIII. TYPICAL ASSIGNMENTS:

Given a schematic of an electronic circuit, construct the circuit on a breadboard and measure the specified characteristics of the circuit, documenting and presenting the results

Given a case study for a non-functioning electronic system, develop an initial troubleshooting plan to logically and effectively isolate the fault

Using Ohm's law and Kirchhoff's laws, calculate the expected voltage and current through a specified component in an electrical circuit and compare it to the measured values of the voltage and current

IX. EVALUATION:
Methods/Frequency

A. Exams/Tests
2 - 4 exams per semester
B. Quizzes
1 per week
C. Projects
1 per semester
D. Home Work
weekly
E. Lab Activities
weekly

X. TYPICAL TEXTS:

1. Sangwine, Stephen. *Electronic Components and Technology.* 3rd ed., CRC Press, 2007.
2. Paynter, Robert, and Toby Boydell. *Electronics Technology Fundamentals: Conventional Flow Version.* 3rd ed., Pearson, 2009.
3. Boydell, Toby, and Robert Paynter. *Laboratory Manual for Electronics Technology Fundamentals: Conventional Flow.* 3rd ed., Pearson, 2009.
4. Floyd, Thomas, and David Buchla. *Electronics Fundamentals: Circuits, Devices and Applications.* 8th ed., Pearson, 2010.
5. Tocci, Ronald, Neal Widmer, and Greg Moss. *Digital Systems: Principles and Applications.* 11th ed., Pearson, 2011.

XI. OTHER MATERIALS REQUIRED OF STUDENTS:
A. Computer with internet access
B. Microsoft Excel software access
C. LT Spice software access
D. Hand-held calculator