ENGT M04: BASIC ELECTRONICS

Originator

srelle

Co-Contributor(s)

Name(s)
Rad, Khosrow (krad)

College

Moorpark College

Attach Support Documentation (as needed)

Engr Adv Comm Meet_Agenda_2018.pdf
Recommendations - Spring 2019.pdf
Attendees for Spring 2019 Advisory Committee.pdf
Engr Adv Comm Meet_Agenda_2019.pdf
Attendees for 2018 Engineering Advisory Committee.pdf
Recommendations - Spring 2018.pdf
ENGT M04_state approval letter_CCC000608542.pdf

Discipline (CB01A)

ENGT - Engineering Technology

Course Number (CB01B)

M04

Course Title (CB02)

Basic Electronics

Banner/Short Title

Basic Electronics

Credit Type

Credit

Honors

No

Start Term

Spring 2020

Catalog Course Description

Introduces the basics of electrical theory and devices including Ohm's Law, magnetism, electromagnetism, voltage, resistance, current, inductance, capacitance, reactance, impedance, phase angle, power-factor, current control devices, sensors and actuators, transformers, motors, power distribution systems, and proper usage of electrical test equipment. Uses concepts of electrical power (Watts, Volt-Amps, Volts-Amps reactive units), energy, and Kirchoff's Laws, along with basic math to solve fundamental electrical problems related to both alternating current (AC) and direct current (DC) circuits. Addresses basic electrical safety procedures.

Taxonomy of Programs (TOP) Code (CB03)

0934.00 - *Electronics and Electric Technology

Course Credit Status (CB04)

D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)

B (Transferable to CSU only)

Course Basic Skills Status (CB08)

N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)

C - Clearly Occupational

Course Cooperative Work Experience Education Status (CB10)
N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)
Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)
N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)
Y - Not Applicable

Course Noncredit Category (CB22)
Y - Credit Course

Funding Agency Category (CB23)
A - Primarily Developed Using Economic Development Funds

Course Program Status (CB24)
1 - Program Applicable

General Education Status (CB25)
Y - Not Applicable

Support Course Status (CB26)
N - Course is not a support course

Field trips
May be required

Faculty notes on field trips; include possible destinations or other pertinent information
Naval Base in Point Mugu or in Port Hueneme; local engineering companies.
(Alternative assignments may be substituted for the field trip)

Grading method
Letter Graded

Alternate grading methods
Credit by exam, license etc.

Does this course require an instructional materials fee?
No

Repeatable for Credit
No

Is this course part of a family?
No

Units and Hours

Carnegie Unit Override
No

In-Class

Lecture
Minimum Contact/In-Class Lecture Hours
35
Maximum Contact/In-Class Lecture Hours
35

Activity

Laboratory
Minimum Contact/In-Class Laboratory Hours
52.5
Maximum Contact/In-Class Laboratory Hours
52.5

Total in-Class

Total in-Class
Total Minimum Contact/In-Class Hours
87.5
Total Maximum Contact/In-Class Hours
87.5

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class
Minimum Outside-of-Class Hours
70
Maximum Outside-of-Class Hours
70

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
157.5
Total Maximum Student Learning Hours
157.5

Minimum Units (CB07)
3
Maximum Units (CB06)
3

Advisories on Recommended Preparation
Ability to solve simple algebraic linear equations in one variable.

Entrance Skills

Entrance Skills
Ability to solve simple algebraic linear equations in one variable.

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:
1	apply concepts of electricity and magnetism to analyze problems and synthesize solutions related to electrical devices.
2	construct, analyze, and troubleshoot RCL (resistor, capacitor, inductor) circuits.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	solve basic electronic problems related to direct current involving resistance, current, voltage, and power applied to both simple and complex combinations of series and parallel circuit components, comprised of resistors, capacitors and coils, in a given network configuration.
2	diagram and discuss the relationship between electricity and magnetism as related to a direct current permanent magnet motor, a solenoid or an electromechanical relay.
3	describe and contrast the construction, operation, and purpose of resistors, potentiometers, switches, fuses, relays, and batteries.
4	explain the basic principles of sinusoidal sources of alternating current (AC) and solve AC network circuit problems involving resistors, capacitors, inductors and transformers.
5	discuss the purpose and effects of resistors, capacitors, inductors and/or transformers in a given AC network problem, analyze it and diagram the solution to a posed problem by using J-Factors (complex numbers) appropriately and accurately.

Course Content

Lecture/Course Content

- **5% - Basics of Conductors, Semiconductors, and Insulators**
  - Subatomic Particles - Electrons, Protons, Neutrons
  - Elements and Compound
  - Valence Electrons and Electrical Conductivity
- **5% - Terminology, Schematic Symbols and Relationships**
  - Series Sources and Loads
  - Parallel Sources and Loads
  - Combination Circuits
- **5% - Current**
  - Electron-Flow
  - Coulombs of Charge
  - Amperes
- **5% - Voltage**
  - Electrical Pressure
  - Electro-Motive-Force (EMF)
  - Series vs. Parallel
- **10% - Ohm's Law**
  - Voltage Calculations
  - Current Calculations
  - Resistance Calculations
- **10% - DC and AC Power (Watt's Law)**
  - Wattage, Volt-Amps, and VAR Calculations
  - Voltage Derivations
  - Current Derivations, and Current Limiting Devices
  - Resistance, Reactance, and Impedance Derivations
- **20% - Kirchhoff's Laws and Magnetism and Electromagnetism**
  - Voltage Law (KVL)
  - Current Law (KCL)
  - Attractive Poles
  - Repulsive Poles
  - Magnetic Flux and Density
  - Permanent Magnetism
  - Temporary Magnetism
  - Current-Flow through Coils, Induced Voltage, and Back-EMF
  - Transformer Types and Applications
  - Motors -Types and Applications
- **25% - Capacitive and Inductive Circuits**
  - Resistor-Capacitor (RC) and Resistor-Inductor (RL) Circuits in Series
  - Resistor-Capacitor (RC) and Resistor-Inductor (RL) Circuits in Parallel
  - RC/RL Time-Constants

- Time-Delay Circuits
- Capacitive and Inductive Actuators and Sensors
- Coils, Capacitors, Transformers, Motors
- Solenoids (Linear and Rotary)
- Relays, Contactors, and Motor Starters
- Electrical Symbols
- Reactance and Impedance
- Voltage and Current Relationships
- Power: Watts; Volt-Amps; Volt-Amps Reactive
- Capacitance and Sensors
- Exotic Devices - Capacitive Switches and Hall-Effect Sensors
- Phase-Angle and Power-Factor
- Applications

- **15% - Basics of Installation, Maintenance, and Troubleshooting**
  - Incoming Power
  - Disconnecting Devices
  - Loads
  - Connections and Connectors
  - Switching Devices
  - Circuit Combinations

Laboratory or Activity Content

- **10% - Current**
  - Electron-Flow
  - Coulombs of Charge
  - Amperes
  - Series vs. Parallel
- **10% - Voltage**
  - Electrical Pressure
  - Electro-Motive-Force (EMF)
  - Series vs. Parallel
- **10% - Power**
  - Wattage in Series and Parallel Circuits
  - Surface Area vs. Heat Dissipation
- **10% - Ohm's Law**
  - Voltage Calculations
  - Current Calculations
  - Resistance Calculations
- **10% - Direct Current and Alternating Current Power (Watt's Law)**
  - Wattage, Volt-Amps, and VAR (Voltage/Ampere/Resistance) Calculations
  - Voltage Derivations
  - Current Derivations, and Current Limiting Devices
  - Resistance, Reactance, and Impedance Derivations
- **20% - Capacitive and Inductive Circuits**
  - Series RC and RL
  - Inductance, Capacitance and Sensors
  - Power: In Watts; in Volt-Amps; and in Volt-Amps Reactive
  - Current Relationships
  - Voltage Relationships
  - Interaction with Resistance: Reactance and Impedance
  - Electrical Symbols
  - Relays, Contactors, and Motor Starters
  - Solenoids (Linear and Rotary)
  - Coils, Transformers, Motors
  - Inductive Actuators and Sensors
  - Time-Delay Circuits

    - RC/RL Time-Constants
    - Parallel RC and RL
- **15% - Source Switching Devices, Loads and Over-Current Limiting**
    - Receptacles
    - Lights
    - Fuses and Breakers and Ground-Fault Circuit Interrupters (GFCIs)
- **15% - Basics of Installation, Maintenance, and Troubleshooting**
    - Incoming Power
    - Disconnecting Devices
    - Loads
    - Connections and Connectors
    - Switching Devices
    - Circuit Combinations

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Problem solving exercises
Skills demonstrations

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Computational homework
Group projects
Individual projects
Laboratory activities
Laboratory reports
Objective exams
Performances
Problem-solving exams
Quizzes
Skills demonstrations
Skill tests

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Computer-aided presentations
Collaborative group work
Class activities
Class discussions
Demonstrations
Field trips
Group discussions
Guest speakers
Instructor-guided interpretation and analysis
Instructor-guided use of technology
Internet research
Laboratory activities
Lecture
Practica
Small group activities

Describe specific examples of the methods the instructor will use:

The instructor will use PowerPoint presentations, problem solving exercises, and demonstrations to explain the concepts of the course.

Representative Course Assignments

Writing Assignments

1. Answer questions from lectures, such as: Identify and describe the need for magnetometers in DC and AC applications.
2. Provide written responses to textbook questions, such as: Describe Ohm's Law in your own words.

Critical Thinking Assignments

1. Diagram and construct logical circuits based on a given formulation, such as: Design four different logical circuits in such a way that in each of them the diode labeled LED1 will emit light for only one combination of both of the switches A1 and B1. Justify the design of your circuits, experiment with your designs, and report your findings.

2. Design combinational logic circuits in teams with a concrete function to meet the design goals, such as: Construct RCL circuits to analyze the time behavior of voltages andcurrents in resistor-capacitor and resistor-inductor circuits (RC and RL circuits), and to measure the timeconstants of simple RC and RL circuits.

Reading Assignments

1. Read assigned chapters from the electronics textbook to prepare for the lecture and accompanying laboratory experiments.

2. Read scientific and technical journal articles relevant to advances in electronics to expand understanding of its usage in research and industry.

Skills Demonstrations

1. Illustrate the ability to construct and test the functionality of circuits in the lab using the materials provided.
2. Illustrate the ability to troubleshoot a circuit that is malfunctioning using the appropriate testing tools.

Outside Assignments

Representative Outside Assignments

1. Write a technical report documenting the response of RC and LR circuits to an alternating voltage at different frequencies by examining the current through the circuit as a function of the frequency of the applied voltage.

2. Research on the Internet the practical uses of RC and LR circuits, addressing why and how these circuits are used in our everyday technology.

Articulation

Equivalent Courses at other CCCs

College	Course ID	Course Title	Units
Bakersfield College	ELET B1A	Basic Electronics	3
College of the Sequoias	ELEC 160	Basic Electronics	3
Taft College	ENER 1530	Electricity and Basic Electronics	3
Cuyamaca College	ET 110	Introduction to Basic Electronics	4

District General Education

A. Natural Sciences

B. Social and Behavioral Sciences

C. Humanities

D. Language and Rationality

E. Health and Physical Education/Kinesiology

F. Ethnic Studies/Gender Studies

Course is CSU transferable

Yes

CSU Baccalaureate List effective term:

Spring 2020

CSU GE-Breadth

Area A: English Language Communication and Critical Thinking

Area B: Scientific Inquiry and Quantitative Reasoning

Area C: Arts and Humanities

Area D: Social Sciences

Area E: Lifelong Learning and Self-Development

CSU Graduation Requirement in U.S. History, Constitution and American Ideals:

IGETC

Area 1: English Communication

Area 2A: Mathematical Concepts & Quantitative Reasoning

Area 3: Arts and Humanities

Area 4: Social and Behavioral Sciences

Area 5: Physical and Biological Sciences

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals

Resource Type
Textbook

Classic Textbook
No

Description
Herman, S. (2019). *Delmar's standard textbook of electricity,* (7th ed.). Cengage Learning.

Resource Type
Textbook

Classic Textbook
No

Description
Floyd, T. L., and Buchla, D.M. (2010). *Electronics fundamentals: Circuits, devices and applications*, (8th ed.). Pearson.

Resource Type
Software

Description
PSpice. Cadence, 9.1 ed.
PSpice is an acronym for Personal Simulation Program with Integrated Circuit Emphasis. This simulation program is for Microsoft Windows.http://www.cadencepcb.com/http://www.electronicslab.com/downloads/schematic/013/

Resource Type
Manual

Description

Buchla, D.M. (2009). *Lab manual for electronics fundamentals and electronic circuits fundamentals, electronics fundamentals: Circuits, devices and applications*, (8th ed.). Pearson.

Library Resources

Assignments requiring library resources

Writing, reading, critical thinking, outside assignments

Sufficient Library Resources exist

Yes

Example of Assignments Requiring Library Resources

Research, using Library's online resources, the various uses of RCL circuits in today's technology.

Primary Minimum Qualification

ENGINEERING TECHNOLOGY

Review and Approval Dates

Department Chair

08/22/2019

Dean

08/26/2019

Technical Review

08/29/2019

Curriculum Committee

09/03/2019

DTRW-I

09/12/2019

Curriculum Committee

MM/DD/YYYY

Board

10/08/2019

CCCCO

10/12/2019

Control Number

CCC000608542

DOE/accreditation approval date

MM/DD/YYYY