ECT110 : Electricity and Electronics Principles

General Information

Author:	• Christopher Herwerth
Course Code (CB01) :	ECT110
Course Title (CB02) :	Electricity and Electronics Principles
Department:	ECT
Proposal Start:	Spring 2026
TOP Code (CB03) :	(0934.00) Electronics and Electric Technology
CIP Code:	(47.0101) Electrical/Electronics Equipment Installation and Repair Technology/Technician, General.
SAM Code (CB09) :	Possibly Occupational
Distance Education Approved:	No
Will this course be taught asynchronously?:	No
Course Control Number (CB00) :	CCC000576232
Curriculum Committee Approval Date:	11/13/2024
Board of Trustees Approval Date:	04/22/2025
Last Cyclical Review Date:	11/13/2024
Course Description and Course Note:	ECT 110 presents the principles and application of electricity and electronics. Students will learn about essential laboratory equipment, various electronics components, and designing and troubleshooting electronic circuits. This course provides students with the knowledge and skills to prepare for a career and/or advanced education in this field.
Justification:	Mandatory Revision
Academic Career:	• Credit
Mode of Delivery:	No value
Author:	No value
Course Family:	No value

Academic Senate Discipline

Primary Discipline:	• Electronic Technology (Radio, television, computer repair, avionics)
Alternate Discipline:	No value
Alternate Discipline:	No value

Course Development

Basic Skill Status (CB08)

Course is not a basic skills course.

☑ Allow Students to Gain Credit by Exam/Challenge

Course Special Class Status (CB13)

Course is not a special class.

Pre-Collegiate Level (CB21)

Not applicable.

Grading Basis

- Grade with Pass / No-Pass Option

Course Support Course Status (CB26)

Course is not a support course

General Education and C-ID

General Education Status (CB25)

Not Applicable

Transferability

Transferable to CSU only

Transferability Status

Pending

Units and Hours

Summary

Minimum Credit Units (CB07)	4
Maximum Credit Units (CB06)	4
Total Course In-Class (Contact) Hours	108
Total Course Out-of-Class Hours	108
Total Student Learning Hours	216

Credit / Non-Credit Options

Course Type (CB04)

Credit - Degree Applicable

Noncredit Course Category (CB22)

Credit Course.

Noncredit Special Characteristics

No Value

Course Classification Code (CB11)

Credit Course.

☐ Variable Credit Course

Funding Agency Category (CB23)

Not Applicable.

☐ Cooperative Work Experience Education Status (CB10)

Weekly Student Hours

	In Class	Out of Class
Lecture Hours	3	6
Laboratory Hours	3	0
Studio Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	0
Course In-Class (Contact) Hours	
Lecture	54

Laboratory	54
Studio	0
Total	108

Course Out-of-Class Hours

Lecture	108
Laboratory	0
Studio	0
Total	108

Time Commitment Notes for Students

No value

Units and Hours - Weekly Specialty Hours

Activity Name	Type	In Class	Out of Class
No Value	No Value	No Value	No Value

Prerequisites, Corequisites, Recommended Corequisites, and Recommended Preparation

Advisory

ECT100 - Analytical Electronics

Objectives

- Demonstrate knowledge and critical thinking skills in the essentials of technical mathematics for electronics.
- Determine appropriate engineering notations and electronics units of measure.

AND

Advisory

ESL141 - Grammar And Writing IV

Objectives

- Compose a 400 to 450-word thesis-based essay which: (a) summarizes and cites appropriately a reading passage provided as a prompt, (b)includes a clear thesis statement, (c) uses evidence to support the thesis, (d) shows clear organization into an introduction, body, and conclusion, and (e) uses appropriate rhetorical modes such as comparison/contrast, cause/effect, and persuasion in order to support a thesis.

Entry Standards

Entry Standards	Description
No value	No value

Course Limitations

Cross Listed or Equivalent Course	Description
No value	No value

Specifications

Methods of Instruction

Methods of Instruction	
Methods of Instruction	Lecture
Methods of Instruction	Laboratory
Methods of Instruction	Discussion
Methods of Instruction	Demonstrations
Methods of Instruction	Presentations

Out of Class Assignments

- Reading
- Calculations (e.g. analyze a circuit using basic circuit laws)

Methods of Evaluation	Rationale
Exam/Quiz/Test	Midterm examination
Other	Manipulation Skills Evaluation

Exam/Quiz/Test	Final Examination

Textbook Rationale

No Value

Textbooks

Author	Title	Publisher	Date	ISBN
Charles Alexander and Matthew Sadiku	Fundamentals of Electric Circuits	McGraw Hill	2023	9781260226409

Other Instructional Materials (i.e. OER, handouts)

No Value

Learning Outcomes

Course Objectives

Determine the value of resistors from their color code, measure DC (Direct Current) and AC (Alternating Current) voltage.

Identify conductors and insulators, and test common types of switches.

Measure current in a circuit, verify Ohm's law, investigate errors in measurement.

Design a series and parallel circuit that will meet specified resistance requirements.

Develop a general rule for calculating the voltage across each resister in an unloaded and loaded resistive voltage divider.

Develop methods of troubleshooting circuits using voltage, current, capacitor, and resistance measurements.

Identify the operating controls of an oscilloscope.

Identify the controls and features of an audio frequency generator.

Describe the effect of AC and DC electrical motors and inductance.

Identify and measure affect transformers and magnetic relays and contactors.

SLOs

Identify the basic concepts of electricity, quantities, and units. Expected Outcome Performance: 70.0

ILOs Core ILOs	Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems.
ECT Electronics & Computer Technology - Electronics Technology Technician	Demonstrate knowledge in electrical and voltage concepts
	Demonstrate knowledge in electrical and voltage concepts
	Demonstrate knowledge in photo-voltaic concepts
	Demonstrate knowledge in photo-voltaic concepts
	Knowledge and training for entry into electronics and electrical industries
	Knowledge and training for entry into electronics and electrical industries

Explain basic circuit laws, measurement, and circuit components. Expected Outcome Performance: 70.0

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Describe basic laboratory equipment and components. Expected Outcome Performance: 70.0

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Determine methods, and measurments, and calculate voltages. Expected Outcome Performance: 70.0

ILOs Core ILOs	Analyze and solve problems using critical, logical, and creative thinking; ask questions, pursue a line of inquiry, and derive conclusions; cultivate creativity that leads to innovative ideas.
	Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems.
ECT Electronics & Computer Technology - Electronics Technology Technician	Demonstrate knowledge in electrical and voltage concepts
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Additional SLO Information

Does this proposal include revisions that might improve student attainment of course learning outcomes?

No

Is this proposal submitted in response to learning outcomes assessment data?

No

If yes was selected in either of the above questions for learning outcomes, explain and attach evidence of discussions about learning outcomes.

No Value

SLO Evidence

No Value

Course Content

Lecture Content

Basic Concepts (5 hours)

- Base units for specifying and calculating energy and work
- Energy conversion and conversion efficiency
- Characteristics of the major particles of an atom
- Nature of electric charge
- Industrial applications of static electricity

Electrical Quantities and Units (5 hours)

- Units of charge, current, voltage, resistance, and power
- Electrical current in solids, liquids, and gases
- Difference and relationship between power and energy
- Express and use the relationship between power, energy, and time
- Convert quantities from base units to submultiple or multiple units and vice versa
- Relationship between energy, charge, and voltage
- Ways of producing voltage

Basic Circuits, Laws, and Measurements (5 hours)

- Relationship between schematic diagrams and physical circuits
- Use of Ohm's law to calculate the current, voltage, and resistance in simple electric circuits
- Calculating the power of a circuit

- Calculating the cost of operating an electric device
- Measuring the current, voltage, and resistance in electric circuits
- Relationship between scales and ranges on multiscale, multirange meters

Circuit Components (4 hours)
- Components and their schematic symbols
- Wire size for electric conductors
- Operating principles of electric components
- Ratings of components
- Terminology for circuit components and faults
- Resistor codes and tolerance

Multiple-Load Circuits (4 hours)
- Identify and classify multiple-load circuits
- Series, parallel, and series-parallel circuits
- Measure correctly the current, voltage, and/or resistance in any part of a multiple load circuit
- Calculate power, current, voltage, and/or resistance for the total circuit or any load in a multiple-load circuit
- Kirchhoff's law
    - Use in conjunction with Ohm's law to solve circuit problems.
- Convert from resistance to conductance
- Relationship between maximum power transfer and efficiency

Complex Circuit Analysis (4 hours)
- Simultaneous equations
- Loop equations using Kirchhoff's voltage law
- Electrical quantities of either single-source or multiple source complex circuits
- Superposition theorem to solve multiple-source complex circuits.
- Advantages of viewing a circuit as a two-terminal network
- Application of Thevenin's theorem and Norton's theorem to reduce complex circuits

Magnetism and Electromagnetism (4 hours)
- Magnetic fields, flux, and forces
- Determining the direction of the magnetic flux created by a current-carrying conductor
- Predict the direction of the force between current-carrying conductors
- Magnetic and non-Magnetic materials
    - Differences
    - Permanent and temporary magnets
- Terminology for magnetism and magnetic circuits
- Magnetic quantities and units
- Principle of operation for motors, generators, transformers, solenoids, and relays

Alternating Current and Voltage (4 hours)
- Differences between forms of alternating and direct current
- Relationship between time and frequency
- Expressing the magnitude of alternating current
- Sine wave generation
- Differences between, and relationship of, mechanical and electrical degrees
- Production of three-phase alternating current
- Characteristics and applications of delta-and wye-connected AC systems
- Advantages of three-phase over single-phase systems

Power in AC Circuits (4 hours)
- Phase relationships in AC circuits
- Phasor diagrams to represent circuit currents and voltages
- Right-triangle relationships to electric circuits to determine phase angles and voltages
- Trigonometric functions to determine resistive and reactive currents and voltages
- Relationship between true power and apparent power
- Power factor of an electric distribution system

Capacitance (5 hours)
- Construction of capacitors and the purpose of each part
- Capacitor behavior in AC and DC circuits
- Capacitance effect on voltage
- Determine the values of reactance, voltage, and current in capacitive circuits
- Capacitor specifications
- Capacitor testing for opens and shorts
- Capacitor charging time

- Relationship between capacitance and voltage drops in a series capacitor circuit

Inductance (4 hours)
- Concepts
- Terminology associated with inductance and inductors
- Common types of inductors
- Specifications
- Lag voltage
- Relationship between inductance, frequency, and reactance
- Circuit values when inductors are connected in series or in parallel
- Inductor resistance
- Inductance relationship to AC and DC current

Transformers (6 hours)
- Symbology
- Terminology
- Operation
    - Voltage levels changes
    - Matching impedances
    - Electrical isolation.
    - Transformer core losses
    - Causes
    - Minimizing losses
    - Calculating
- Transformer selection and ratings
- Connecting three-phase transformer windings in either a delta or a wye configuration
- Connecting transformer windings in series and/or parallel to obtain the desired voltage and current capabilities

Total hours: 54

Laboratory/Studio Content

Basic Concepts (5 hours)
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- Energy conversion and conversion efficiency
- Characteristics of the major particles of an atom
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Additional Information

Repeatability

Not Repeatable

Justification (if repeatable was chosen above)

No Value

Is it possible this course will have a material fee?

No Value

I have contacted my library liaison (https://campusguides.glendale.edu/faculty/liaisons):

No Value

What term(s) will this course be offered?

No Value

Will any additional resources be needed for this course? (Click all that apply)

No Value

If additional resources are needed, add a brief description and cost in the box provided.

No Value

Resources

Did you contact your departmental library liaison?

No

If yes, who is your departmental library liason?

Adina Lerner (Technology & Aviation, Visual & Performing Arts)

Did you contact the DEIA liaison?

No

Were there any DEIA changes made to this outline?

No

If yes, in what areas were these changes made:

No Value

Will any additional resources be needed for this course? (Click all that apply)

- No

If additional resources are needed, add a brief description and cost in the box provided.

No Value