## COURSE OUTLINE

| BASIC ELECTRONICS | GE 114 |
|---|---|
| Course Title | Dept & Course No. |

**I. COURSE DESCRIPTION**

This course teaches the students about electrical quantities, laws and theorems that govern DC and AC electronic circuits. It also deals with basic digital circuits, basic electronic components, their circuit applications and how to test them using the multi-meter.

**II. SEMESTER CREDIT:** 3

**III. CONTAC HOURS PER WEEK:**

| 2 | 3 | 5 |
|---|---|---|
| Lecture | Lab | Total |

**IV. PREREQUISITE:** *NONE*

**V. STUDENT LEARNING OUTCOMES:**

Upon completion of the course, the students will be able to, with 65% accuracy to;

1. Read and interpret electronic diagrams
2. Explain the basic concepts of electricity.
3. Decode the color coded value of resistor
4. Explain the electrical characteristics of resistor in a circuit.
5. Explain the concepts of magnetism and electromagnetism.

**VI. COURSE CONTENT**

A. Electrical/Electronic schematics
   1) Electrical/electronic symbols
   2) Reading and interpreting diagrams and schematics
B. Electrical/Electronic Fundamentals
   1) Definition, Physical, and Chemical State of Matter
   2) Composition of Mater
   3) Structure of the Atom
   4) Conductors, Semiconductors, and insulators
   5) Three Important Electrical Quantities
C. Electrical Quantities and Components
   1) Basic Electrical Units and Abbreviations
   2) Using Metric System
   3) Conductor and Their Characteristics
   4) Resistor
   5) Resistor Color Code
D. Introduction to Ohm's Law
   1) Ohms Law & Relationship between Electrical Quantities
   2) Three Common Arrangement for The Ohm's Law
   3) Application of Metric Prefixes and Power of 10
   4) Direction of Current Flow
   5) Polarity and Voltage
   6) Comparison of Circuit Current Directions from DC and AC Sources
E. Magnetism and electromagnetism
   1) Background information.

2) Fundamental laws, rules, and terms to describe magnetism
3) Elemental electromagnetism
4) Important of magnetic units, terms symbols, and formulas
5) Practical consideration about core materials

6. Explain the basic concepts of inductance

F. Inductance
1) Self inductance
2) Factors that determine inductance value of inductors
3) Energy stored in the inductor's magnetic field
4) L/r time constant
5) Practical application and troubleshooting hints

7. Evaluate the electrical behavior of the resistor and inductor in an ac circuits.

G. Inductive reactance
1) Concept of inductive reactance
2) Relationship of XL to inductance value
3) Relationship of XL to frequency of AC
4) Inductive reactance in series and parallel
5) Inductor q factor

H. RL Circuits in AC
1) Using vectors to describe and magnitude and directions
2) Basic ac circuit analysis and techniques
3) Fundamental analysis of series RL circuits
4) Fundamental analysis of parallel RL circuits
5) Practical application for inductor and RL circuits

8. Asses the performance of transformer in a circuit.

I. Basic transformer characteristics.
1) Background information
2) Coefficient coupling
3) Mutual inductance and transformer action
4) Transformer ratios
5) Transformer losses
6) Characteristics of selected transformer
7) Practical application and troubleshooting hints

9. Explain the basic concepts of capacitance

J. Capacitance
1) Definition and description of a capacitor
2) Unit of capacitance
3) Factors affecting capacitance value
4) Total capacitance in series and parallel
5) Finding voltage when capacitor

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| | are in series<br>6) RC time constant<br>7) Types of capacitor<br>8) Typical color codes of capacitor<br>9) Practical application and troubleshooting hints |
| 10. Evaluate the electrical behavior of resistor and capacitor connected in AC circuits | K. RC Circuits in AC<br>1) Series RC circuit analysis<br>2) Phase-shift application of series RC network<br>3) Parallel RC circuit analysis<br>4) Similarities and difference between RC and RL circuits<br>5) Applications of RC circuit<br>6) Troubleshooting hints and consideration for RC circuits<br>L. Capacitive Reactance<br>1) Concept of Capacitive Reactance<br>2) Relationship of XC to capacitance value<br>3) Relationship of XC to Frequency<br>4) Method to Calculate XC<br>5) Capacitive Reactance in Series and Parallel<br>7) Voltage, Current, and Capacitive reactance |
| 11. Explain basic concepts of semiconductor | M. Semiconductor Materials and P-N Junctions<br>1) Semiconductor Materials<br>2) The P-N Junction<br>N. Semiconductor Components<br>1) Diodes<br>2) Bipolar Transistors<br>3) Field-Effect Transistors<br>4) Integrated Circuits<br>5) Thyristors<br>6) Optoelectronics |
| 12. Identify defective passive electronic components using appropriate testing /measuring instrument. | O. Checking/Testing defective components<br>1) Checking/Testing switches<br>2) Checking/Testing resistors<br>3) Checking/Testing capacitor<br>4) Checking/Testing transformer<br>5) Checking/Testing semiconductor components. |
| 13. Design electronics circuits using electronic CAD | P. Multisim Software<br>1) Creating new project<br>2) Changing the value of components<br>3) Setting the test instruments<br>4) Connecting wires<br>5) Running the simulator<br>6) Saving and printing the design |
| 14. Assemble and test an electronic circuit | Q. Electronic Circuits<br>1) Power Supply<br>2) Electronic Siren<br>3) Burglar Alarm |

15. Construct digital logic circuit.

4) Light Flasher

R. Digital Logic Circuit
   1) Number systems
   2) Binary Arithmetic
   3) Hexadecimal and BCD Arithmetic
   4) Logic Gates
   5) Fundamental logic design

## VII. MATERIALS AND EQUIPMENT

A. MATERIALS
   1. Analogue and Digital Trainer
   2. Multimeters (digital and analog)
   3. Resistors (assorted values) 1 Watt
   4. Capacitors (assorted values)
   5. Copper Board
   6. Diodes, Transistors
   7. Coils, inductors and Transformers
   8. Electronic project kit
   9. AWG # 22 Solid Wires, AWG #22 Stranded Wires (assorted colors)
   10. Triplex Shielded wire
   11. Soldering Lead
   12. Calculator
   13. Electronic hand tools
   14. Switches, Connectors and Fuses
   15. Digital logic IC's

## VIII. TEXT AND REFERENCES

A. *Required Text*
   Gates, Earl. **INTRODUCTION TO ELECTRONICS**. USA: Delmar Cengage Learning, 2012.

## IX. METHOD OF INSTRUCTION

A. Lecture for the presentation of theory.
B. Demonstration for the presentation of skills.
C. Computer Aided Learning
D. Research/calculations
E. Practical experiments for emphasis of known principles.

## X. METHOD OF EVALUATION

A. Knowledge will be evaluated using the following methods:
   1. Written test
   2. Graded recitation/Oral presentation
   3. Instructor's Interview

B. Skills will be evaluated using the following criteria:
   1. Accuracy
   2. Quality of work
   3. Safety
   4. Timeliness/Completion

C. Midterm and final grade are computed and weighted using the following criteria:

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| Participation | 10% |
| Portfolio | 10% |
| Quizzes/Homework | 10% |
| Midterm/Final Examination | 20% |
| Laboratory Performance/Project | 50% |
| TOTAL = | 100 |

D. Transmutation of total percent to letter grade:

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|---|---|
| 90-100% | A |
| 80-89% | B |
| 70-79% | C |
| 65-69% | D |
| 00-64% | F |

## TASK LISTING

| GE 114 Basic Electronics | Credit: | 2 | 3 | 48 |
|---|---|---|---|---|
| Course No. & Title | | Lec | Lab | Total Lab Hrs |

| COURSE LEARNING OUTCOMES | Allotted Hours |
|---|---|
| 1. ***Read and interpret electronic diagrams***<br>1.1 Draw electronic symbols<br>1.2 Identify electronics components though diagram.<br>1.3 Draw simple electronics diagram | 3 |
| 2. ***Identify and replace the defective parts of electronic circuits***<br>2.1 Verify the theory of Ohm's Law in actual circuits<br>2.2 Investigate the electrical characteristics of resistor in a series circuit<br>2.3 Investigate the electrical characteristics of resistor in a parallel circuit<br>2.4 Investigate the electrical characteristics of resistor in a series-parallel circuit.<br>2.5 Construct an application circuit for magnetism and electromagnetism<br>2.6 Investigate characteristics of inductor in an AC circuits<br>2.7 Measure the inductive reactance of inductor in series and parallel<br>2.8 Investigate the operation RL circuits in AC<br>2.9 Test and check the performance of transformer in a circuit<br>2.10 Test at check the performance of capacitor in a circuit<br>2.11 Investigate the effect of AC signal in the capacitive reactance of capacitor in series and parallel<br>2.12 Investigate the characteristics of resistor-capacitor in AC circuit<br>2.13 Determine different types of defects in semiconductor components<br>2.14 Identify defective electronic components using appropriate testing instruments<br>2.15 Replace defective electronic components. | 10 |
| 3. ***Design electronics circuits using electronic CAD***<br>3.1 Design an electronics circuit using the multisim software<br>3.2 Simulate electronic circuit in MULTISIM software | 10 |
| 4. ***Assemble and test an electronic circuit***<br>4.1 Layout electronic components on the PCB according to schematic diagram<br>4.2 Prepare PCB for etching<br>4.3 Perform PCB etching<br>4.4 Assemble an electronic circuit | 15 |
| 5. ***Construct digital logic circuit***<br>5.1 Investigate Flip-flop operations.<br>5.2 Connect and operate different logic gates.<br>5.3 Troubleshoot and repair sequential controller circuit | 10 |
| | 48 |

**Palau Community College**
**GE 114 BASIC ELECTRONICS**
**Course Learning Outcomes**

During the course experience, the ***course learning outcomes*** (CLO) will be assessed through the use of signature assignments. A rating scale will be used to determine the students' proficiency level of each CLO using specifically aligned assignments. The numerical rating of 4,3,2 and 1 are not intended to represent the traditional school grading system of A, B, C, D and F. The descriptions associated with each of the numbers focus on the level of student performance for each of the course learning outcome listed below.

Rating Scale:
5. Excellent
4. Above average
3. Average
2. Below Average
1. Unacceptable

**1. Read and interpret electronic diagrams**

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| **5** | The student is able to read and interpret electronic diagrams without any supervision and instruction |
| **4** | The student is able to read and interpret electronic diagrams with limited supervision but no instruction |
| **3** | The student is able to read and interpret electronic diagrams with limited supervision and limited instruction |
| **2** | The student has difficulty to read and interpret electronic diagrams and requires considerable supervision and instruction |
| **1** | The student is unable to read and interpret electronic diagrams. |

**2. Identify and replace the defective parts of electronic circuits**

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|---|---|
| **5** | The student is able to identify and replace the defective parts of electronic circuits without any supervision and instruction |
| **4** | The student is able to identify and replace the defective parts of electronic circuits with limited supervision but no instruction |
| **3** | The student is able to identify and replace the defective parts of electronic circuits with limited supervision and limited instruction |
| **2** | The student has difficulty to identify and replace the defective parts of electronic circuits and requires considerable supervision and instruction |
| **1** | The student is unable identify and replace the defective parts of electronic circuits. |

**3. Design electronics circuits using electronic CAD**

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| **5** | The student is able to design electronics circuits using electronic CAD without any supervision and instruction |
| **4** | The student is able to design electronics circuits using electronic CAD with limited supervision but no instruction |
| **3** | The student is able to design electronics circuits using electronic CAD with limited supervision and limited instruction |
| **2** | The student has difficulty to design electronics circuits using electronic CAD and requires considerable supervision and instruction |
| **1** | The student is unable to design electronics circuits using electronic CAD. |

4. **Assemble and test an electronic circuit**

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| 5 | The student is able to assemble and test an electronic circuit without any supervision and instruction |
| 4 | The student is able to assemble and test an electronic circuit with limited supervision but no instruction |
| 3 | The student is able to assemble and test an electronic circuit with limited supervision and limited instruction |
| 2 | The student has difficulty to assemble and test an electronic circuit and requires considerable supervision and instruction |
| 1 | The student is unable to assemble and test an electronic circuit. |

5. **Construct digital logic circuit**

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|---|---|
| 5 | The student is able to construct digital logic circuit without any supervision and instruction |
| 4 | The student is able to construct digital logic circuit with limited supervision but no instruction |
| 3 | The student is able to construct digital logic circuit with limited supervision and limited instruction |
| 2 | The student has difficulty to construct digital logic circuit and requires considerable supervision and instruction |
| 1 | The student is unable to construct digital logic circuit. |