

COURSE OUTLINE

Basic Electricity

Course Title

ET 111

Dept & Course No.

I. COURSE DESCRIPTION

This course introduces fundamental concepts, theories and principles necessary for a successful career in electrical installation. It deals with construction, analysis and verification of AC and DC circuits necessary for electrical career. It trains students with blending concepts relating to electrical theories to practical information commonly encountered in electrical works.

III. SEMESTER CREDIT: 4

IV. CONTACT HOURS PER WEEK:

<u>3</u>	<u>1</u>	<u>4</u>
Lecture	Lab	Total

V. PREREQUISITE: NONE

VI. COURSE LEARNING OUTCOME:

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

1. Apply basic electrical theories and principles in electrical circuits

VII. COURSE CONTENT

- A Fundamentals of electricity
 - a History of electricity
 - b Static electricity
 - c Dynamic electricity
 - d Electron theory
 - e Sources of electricity
 - f Electrical quantities
 - g Current, voltage and resistance
- B Conductors and insulators
 - a Properties of electrical conductor
 - b Common types of electrical conductor
 - c Properties of insulators
 - d Common types of insulators used in electrical installation
 - e Procedures in determining wire sizes
 - f American Wire Gauge tables
 - g Basic electrical circuits
 - h Capacitor
 - (1) Principles and concepts of capacitor
 - (2) Different types of resistor and its application
 - (3) Connecting capacitors in series
 - (4) Connecting capacitors in parallel
 - (5) Magnetism and electromagnetism
- C Direct current
 - a Introduction to Ohms law
 - b Introduction to Power Law
- D Alternating current
 - a Introduction to Ohms Law in AC

2. Determine resistors/capacitors value through color coding

3. Measure electrical quantities using electrical measuring devices

4. Splice/Join electrical conductor according to National Electrical Code

5. Connect battery/solar modules to suit voltage and current capacity requirements

- circuits
 - b. Single phase transformer
 - c. Three phase system
- E. Three phase power generation
 - a. Wye and delta connection
 - b. Three phase transformer
- F. Resistor
 - a. Different types of resistor and its application
 - b. Four band resistor
 - c. Five band resistor
 - d. Resistor color coding
- G. Capacitor
 - a. Different types of capacitor and its application
 - b. Capacitor coding
- H. Electrical measuring instruments
 - a. Ohmmeter
 - b. Voltmeter
 - c. Ammeter
 - d. Multimeter
 - e. Measuring electrical quantities
 - f. Proper handling of measuring devices
- I. Splices and Joints
 - a. Different types of splices and joints
 - b. Splicing and joining electrical conductor
 - c. Soldering spliced/joint conductor
 - d. Splicing conductor using solderless connectors
 - e. Soldering splices and joints
- J. Battery
 - a. Principles and operation of battery
 - b. Different types of battery
 - c. Primary and secondary cell
 - d. Connecting battery in series/parallel
 - e. Solar Modules

VIII. MATERIALS AND EQUIPMENT

- | | | | |
|----|-----------------------------|----|----------------------|
| A. | Basic electrical hand tools | J. | Power supply |
| B. | Magnet | K. | 9 volts battery |
| C. | Electromagnet | L. | 9 volts bulb |
| D. | 1.5V Battery | M. | lamp holder |
| E. | Transformer | N. | inductor |
| F. | Resistor | O. | Connecting leads |
| G. | Capacitor | P. | Lamp control trainer |
| H. | Soldering iron | | |
| I. | Lead | | |

IX. TEXT AND REFERENCES

A. Required Text

Mazur, Glen A and Zurlis Peter A. **ELECTRICAL PRINCIPLES AND PRACTICES 4th Edition**, American Technical Publisher Inc; Homewood Illinois, 2013.

Mazur, Glen A and Zurlis Peter A. **ELECTRICAL PRINCIPLES AND PRACTICES 4th Edition WORKBOOK**, American Technical Publisher Inc; Homewood Illinois, 2013.

X. METHOD OF INSTRUCTION

- A. Lecture-discussion
- B. Demonstration
- C. Video Presentation
- D. Self-pace learning
- E. Peer Teaching
- F. Laboratory Performance

XI. 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:

Class participation.....	15%
Quizzes/Short Tests.....	20%
Midterm/Final Exams.....	25%
Lab Performance.....	40%
TOTAL	100%

D. Transmutation of total percent to letter grade:

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

TASK LISTING

ET 111

Course No. Title

Credit:

3

Lec

1

Lab

48

Total Lab Hrs

STUDENT LEARNING OUTCOMES	Allotted Hours
<p>1. Apply basic electrical theories and principles in electrical circuits</p> <ul style="list-style-type: none"> a. Demonstrate how electrical energy is produced through different sources. b. Explore theories and principles of magnetism and electromagnetism c. Identify different types of insulation used for electrical conductors d. Calculate wire size for a given load using wire tables e. Identify the appropriate type of insulation for a given load and ambient temperature using wire tables f. Compute for the ampacity of the given conductor. g. Calculate the voltage drop of the conductor with the given length, type of material and ambient temperature. h. Measure electrical conductor using American wire gauge. i. Determine how AC three phase power is produced. j. Determine how three phase transformer works through lab experiments. 	22
<p>2. Determine capacitor/resistor value through color coding</p> <ul style="list-style-type: none"> a. Determine resistor values through color coding b. Identify different types of resistors/capacitor c. Decode capacitor value 	6
<p>3. Measure electrical quantities using electrical measuring devices</p> <ul style="list-style-type: none"> a. Measure resistance using ohmmeter b. Measure voltage and resistance using multimeter c. Measure power using wattmeter d. Measure current using ammeter 	6
<p>4. Splice/Join electrical conductor according to National Electrical Code</p> <ul style="list-style-type: none"> a. Determine the applications of each splices and joints b. Splice/join electrical conductors according to NEC standard. c. Splice/join electrical conductor using solderless connector d. Solder splices and joints 	6
<p>5. Connect battery to suit voltage and current capacity requirements</p> <ul style="list-style-type: none"> a. Calculate total voltage and capacity of battery in series b. Calculate total voltage and capacity of battery in parallel c. Connect battery to suit for voltage and capacity requirements. 	3
	48

Palau Community College
ET 111 Basic Electricity
Course Learning Outcomes

During the course experience, the **course learning outcomes** (CLOs) 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 ratings of 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 of each of the course learning outcomes listed below:

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

CLO 1: Apply electrical theories and principles in electrical circuit.

5	The student is able to apply electrical theories and principles in electrical circuit without any supervision and instruction.
4	The student is able to apply electrical theories and principles in electrical circuit with limited supervision but no instruction.
3	The student is able to apply electrical theories and principles in electrical circuit with limited supervision and limited instruction.
2	The student has difficulty to apply electrical theories and principles in electrical circuit and requires considerable supervision and instruction.
1	The student is unable to apply electrical theories and principles in electrical circuit even with supervision and instruction.

CLO 2: Determine values of resistors/capacitors through color coding.

5	The student is able to apply electrical theories and principles in electrical circuit without any supervision and instruction.
4	The student is able to apply electrical theories and principles in electrical circuit with limited supervision but no instruction.
3	The student is able to apply electrical theories and principles in electrical circuit with limited supervision and limited instruction.
2	The student has difficulty to apply electrical theories and principles in electrical circuit and requires considerable supervision and instruction.
1	The student is unable to apply electrical theories and principles in electrical circuit even with supervision and instruction.

CLO 3: Measure unknown electrical quantities using electrical measuring instruments.

5	The student is able to measure unknown electrical quantities using electrical measuring instruments without any supervision and instruction.
4	The student is able to measure unknown electrical quantities using electrical measuring instruments with limited supervision but no instruction.
3	The student is able to measure unknown electrical quantities using electrical measuring instruments with limited supervision and limited instruction.
2	The student has difficulty to measure unknown electrical quantities using electrical measuring instruments and requires considerable supervision and instruction.
1	The student is unable to measure unknown electrical quantities using electrical measuring instruments even with supervision and instruction.

CLO 4: Splice/Join electrical conductors according to National Electrical Code.

5	The student is able to splice/Join electrical conductors according to National Electrical Code without any supervision and instruction.
4	The student is able to splice/Join electrical conductors according to National Electrical Code with limited supervision but no instruction.
3	The student is able to splice/Join electrical conductors according to National Electrical Code with limited supervision and limited instruction.
2	The student has difficulty to splice/Join electrical conductors according to National Electrical Code and requires considerable supervision and instruction.
1	The student is unable to splice/Join electrical conductors according to National Electrical Code even with supervision and instruction.

CLO 5: Connect battery to suit for voltage and current capacity requirements.

5	The student is able to connect battery to suit for voltage and current capacity requirements without any supervision and instruction
4	The student is able to connect battery to suit for voltage and current capacity requirements with limited supervision but no instruction
3	The student is able to connect battery to suit for voltage and current capacity requirements with limited supervision and limited instruction
2	The student has difficulty to connect battery to suit for voltage and current capacity requirements and requires considerable supervision and instruction
1	The student is unable to connect battery to suit for voltage and current capacity requirements even with supervision and instruction.

MARKING SHEET
ET 111 Basic Electricity
INSTALLING ELECTRICAL WIRING USING 3-WAY AND 4-WAY SWITCHES

Name of student: _____

Date: _____

CLO 2 – MEASURE UNKNOWN ELECTRICAL QUANTITIES USING ELECTRICAL MEASURING INSTRUMENT

CRITERIA	ALLOTTED POINTS	GAINED POINTS	FINAL GRADE
ACCURACY	10 or 1		50%
1. Resistance of all the loads are measured accurately using ohmmeter	10 or 1		Average of gained points X 10 X 35%
2. Voltage drop across each load is measured accurately using voltmeter	10 or 1		
3. Current at each load is measured accurately using ammeter	10 or 1		
SAFETY, PROPER USED OF TOOLS, MATERIALS AND EQUIPMENT			25%
1. Area is cleaned every after each session	10		Average of gained points times 10 times 20%
2. Tools and equipment properly used.	10		
3. Materials are used properly	10		
4. Safety procedure is strictly observed within the duration of work	10		
TIMELINESS/COMPLETION			25%
1. Work is submitted one or more days ahead of due date	10		Average of gained points times 10 times 20%
2. Work submitted on due date	8		
3. Work submitted a day after due date	4		
4. Work submitted more than two days after due date	0		
TOTAL			

CLO 3 – SPLICE/JOIN ELECTRICAL CONDUCTORS ACCORDING TO NATIONAL ELECTRICAL CODE

CRITERIA	ALLOTTED POINTS	GAINED POINTS	FINAL GRADE
ACCURACY	10 or 1		35%
1. Joints and splices are electrically and mechanically coupled to withstand pressure and tension.	10 or 1		Average of gained points X 10 X 35%
2. Joints and splices are made inside boxes and conduit fittings.	10 or 1		
3. Joints and splices are appropriately insulated using approved type of insulating material.	10 or 1		
WORKMANSHIP (QUALITY OF WORK/APPEARANCE)			25%
1. Joined/Spliced conductors are free from groove or nick to ensure current carrying capacity is not lessened.	10		Average of gained points times 10 times 25%
2. Joints and splices contain appropriate number of necessary twists and turns.	10		
3. Joints and splices twists and turns are done evenly and neatly.	10		
SAFETY, PROPER USED OF TOOLS, MATERIALS AND EQUIPMENT			20%
1. Area is cleaned every after each session	10		Average of

2. Tools and equipment properly used.	10		gained points times 10 times 20%
3. Materials are used properly	10		
4. Safety procedure is strictly observed within the duration of work	10		
TIMELINESS/COMPLETION			20%
1. Work is submitted one or more days ahead of due date	10		Average of gained points times 10 times 20%
2. Work submitted on due date	8		
3. Work submitted a day after due date	4		
4. Work submitted more than two days after due date	0		
TOTAL			

Assessor

MARKING GUIDE
ET 111 Basic Electricity
INSTALLING ELECTRICAL WIRING USING 3-WAY AND 4-WAY SWITCHES

CRITERIA	
ACCURACY	
1.	Turning S ₃ A, S ₃ B, and S ₄ in "L" position, R1 turns ON at full brightness
2.	Turning S ₃ A and S ₃ B in "L" and S ₄ in "R" position, R1 turns ON at full brightness
3.	Turning S ₃ A in "L", S ₃ B in "R" and S ₄ in "R" position, R2 turns ON at full brightness
4.	Turning S ₃ A in "R", S ₃ B in "L" and S ₄ in "L" position, R1 and R2 turns ON at full brightness
5.	Turning S ₃ A in "R", S ₃ B in "L" and S ₄ in "R" position, R2 turns ON at full brightness
6.	Turning S ₃ A in "R", S ₃ B in "R" and S ₄ in "L" position, R2 turns ON at full brightness
7.	Turning S ₃ A in "R", S ₃ B in "R" and S ₄ in "R" position, R1 and R2 turns ON at full brightness
8.	Turning S ₃ A in "L", S ₃ B in "R" and S ₄ in "L" position, R1 turns ON at full brightness
	<ul style="list-style-type: none"> • If the above criteria are met, 10 points is awarded. If the criteria are not met, 1 point is awarded.
QUALITY OF WORK (WORKMANSHIP)	
1.	Electrical components are installed according to measurements given. <ul style="list-style-type: none"> • 2 points deduction for every incorrect measurement. Tolerance: ±5%
2.	Electrical boxes are securely fastened on wiring boards <ul style="list-style-type: none"> • 2 points deduction for every electrical box fastened improperly
3.	Electrical boxes are aligned and leveled according to plans and specifications <ul style="list-style-type: none"> • 2 points deduction for every component not properly aligned and leveled.
4.	Pipes/conduits are bent in accordance with NEC standards <ul style="list-style-type: none"> • 2 points deduction for every defective bend.
5.	Pipes/conduits are supported according to NEC standards <ul style="list-style-type: none"> • 2 points deduction for every conduit not secured according to NEC standards.
6.	Pipes/conduits entry point is secured by appropriate fittings <ul style="list-style-type: none"> • 2 points deduction for every entry point not secured by appropriate fitting.
7.	Splices and joints are done in accordance with NEC <ul style="list-style-type: none"> • 2 points deduction for every entry point not secured by appropriate fitting.
8.	Splices and joints are insulated in accordance with NEC <ul style="list-style-type: none"> • 2 points deduction for every entry point not secured by appropriate fitting.
SAFETY, PROPER USED OF TOOLS, MATERIALS AND EQUIPMENT	
1.	Area is cleaned upon completion of the job <ul style="list-style-type: none"> • 10 points is awarded to properly cleans area • 6 points is awarded for slightly cleaned area • No point is awarded if the area is unclean.
2.	Tools and equipment properly used. <ul style="list-style-type: none"> • 2 points deduction for every improper use of tools and/or equipment
3.	Materials are used properly <ul style="list-style-type: none"> • 2 points deduction for every improper use of materials
4.	Safety procedure is strictly observed within the duration of work <ul style="list-style-type: none"> • 2 points deduction for every violation of safety rules.
TIMELINESS/COMPLETION	
1.	10 points is awarded if work is submitted one or more days ahead of due date
2.	8 points is awarded if work submitted on due date
3.	4 points is awarded if work submitted a day after due date
4.	Zero for the work submitted more than two days after due date