COURSE OUTLINE

Basic Electrical Wiring for Non-Majors — Course Title

ET 110 — Dept & Course No.

I. COURSE DESCRIPTION

This course is designed to provide non-electrical major students with technical knowledge and skills relevant in construction sites. It deals with fundamental concepts of electricity to practical skills required in the workplace. It covers basic safety practices in dealing with electrical works, proper use of basic electrical hand tools, electrical devices and protections, connecting and installing simple electrical circuits and basic wiring for single-family dwelling unit.

III. SEMESTER CREDIT: 3

IV. CONTAC HOURS PER WEEK:

2	3	5
Lecture	Lab	Total

V. PREREQUISITE: NONE

VI. STUDENT LEARNING OUTCOMES:

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

1. Apply basic electrical theories and principles in electrical wiring installations
2. Measure electrical quantities using electrical measuring devices

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. Basic electrical circuits
   g. Ohms law
   h. Power Law

B. Electrical hand tools and equipment
   a. Basic electrical hand tools and their uses
   b. Proper use of hand tools and equipment
   c. Maintaining basic hand tools

C. 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

D. Electrical measuring instruments
   a. Ohmmeter
   b. Voltmeter
   c. Ammeter
   d. Measuring electrical quantities

	E. Proper handling of measuring devices
3. Splice/Join electrical conductor according to National Electrical Code	F. 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
4. Install wiring and protective devices and lighting fixtures according to plans and specifications.	G. Wiring devices a. Single pole switch b. Three-way switch c. Four-way switch d. Receptacle outlet e. Special purpose outlet f. Lamp receptacles
	H. Diagramming a. Schematic diagrams b. Wiring diagram c. Interpreting electrical diagram d. Drawing/Sketching electrical diagrams
	I. Electrical lighting a. Principles and operation of Incandescent lamps b. Principles and operation of fluorescent lamps c. Advantages of fluorescent lamp over incandescent lamps d. Different types of fluorescent lamps e. Assembling fluorescent fixtures. f. Installing lighting fixtures
	J. Protective devices a. Fuse b. Circuit breakers c. Advantages and disadvantages of circuit breaker over fuse.
5. Install electrical wiring for single family dwelling unit using sheathed nonmetallic cable according to plans and specifications.	K. Installing electrical wiring L. National Electrical Code provisions in installing sheathed non metallic cable M. Installing boxes and fittings N. Installing lighting fixtures O. Installing protective devices P. Sheathed non-metallic cable Q. NEC requirements in installing electrical wiring using sheathed non-metallic cable. R. Installing electrical wiring for single family dwelling unit

VIII. MATERIALS AND EQUIPMENT

A. Lamp Control Trainer
B. Skeleton house for wiring installation
C. Wiring booth
D. Basic electrical hand tools and equipment
E. Multi-meter
F. Clamp ammeter
G. Sheathed nonmetallic cable
H. Utility box
I. Screw
J. Lamp receptacle
K. Incandescent lamps
L. Twist-on connectors
M. Cable clamps
N. Convenience outlet receptacle
O. Panel board
P. Junction box

IX. TEXT AND REFERENCES

A. Required Text
Kaltwasser, Flowers and Blasingame. ***BASIC WIRING,*** Multi state Academic and Vocational Curriculum Consortium, 2005

B. Supplementary Reference
Herman, Stephen. ***ELECTRICTY*** , USA: Delmar Publishers Inc; 1999.

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. Final grade is 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 110 Basic Electrical Wiring for Non-Majors	Credits:	2	1	48
Course No. & Title		Lec	Lab	Total Lab Hrs

STUDENT LEARNING OUTCOMES	Allotted Hours
1. ***Apply basic electrical theories and principles in electrical wiring installations*** a. Demonstrate how electrical energy is produced though different sources. b. Calculate unknown quantities using Ohm's Law c. Calculate unknown quantities using Power Law d. Explore theories and principles of magnetism and electromagnetism e. Perform experiments in electrical circuit. f. Calculate wire size for a given load using wire tables g. Compute for the ampacity of the given conductor.	6
2. ***Measure electrical quantities using electrical measuring devices*** a. Measure resistance using ohmmeter b. Measure current using ammeter c. Measure voltage using voltmeter d. Connect electrical measuring instrument in the circuit e. Perform experiments in series and parallel circuits using measuring instruments.	5
3. ***Splice/Join electrical conductor*** a. Splice/Join electrical conductor b. Splice/Join electrical conductor using solderless connectors. c. Solder spliced/joined electrical conductor.	5
4. ***Install wiring & protective devices and lighting fixtures according to plans and specifications*** a. Identify different types of wiring devices used in electrical wiring b. Draw electrical diagram c. Convert schematic diagrams to wiring and one line diagram. d. Convert one line diagram into schematic and wiring diagram. e. Connect lamp controlled in one location by single pole switch f. Connect lamp controlled in two different locations using three-way switch g. Connect lamp controlled in three different locations using three-way and four-way switch h. Connect receptacle outlets. i. Demonstrate how the different parts of fluorescent lamp work. j. Assemble fluorescent lamp k. Install lighting fixtures l. Install correct rating of fuse/circuit breaker of a given load.	12
5. ***Install electrical wiring of single family dwelling unit using sheathed nonmetallic cable according to plans and specifications.*** a. Identify different types of boxes and fittings used in electrical installation according plans and specifications. b. Install boxes and fittings c. Install electrical protective device d. Install electrical wiring in accordance with plans and specifications e. Install electrical wiring in accordance with the latest edition of the National Electrical Code	20
	48

Palau Community College
ET 110 Basic Electrical Wiring for Non-majors
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 wiring installation.

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

CLO 2: 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 3: 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 4: Install lighting fixtures according to plans and specifications.

5	The student is able to install lighting fixtures according to plans and specifications without any supervision and instruction.
4	The student is able to install lighting fixtures according to plans and specifications with limited supervision but no instruction.
3	The student is able to install lighting fixtures according to plans and specifications with limited supervision and limited instruction.
2	The student has difficulty to install lighting fixtures according to plans and specifications and requires considerable supervision and instruction.
1	The student is unable to install lighting fixtures according to plans and specifications even with supervision and instruction.

CLO 5: Install electrical wiring for single family dwelling unit using sheathed non-metallic cable according to plans and specifications.

5	The student is able to install electrical wiring for single family dwelling unit using sheathed non-metallic cable according to plans and specifications without any supervision and instruction.
4	The student is able to install electrical wiring for single family dwelling unit using sheathed non-metallic cable according to plans and specifications with limited supervision but no instruction.
3	The student is able to install electrical wiring for single family dwelling unit using sheathed non-metallic cable according to plans and specifications with limited supervision and limited instruction.
2	The student has difficulty to install electrical wiring for single family dwelling unit using sheathed non-metallic cable according to plans and specifications and requires considerable supervision and instruction.
1	The student is unable to install electrical wiring for single family dwelling unit using sheathed non-metallic cable according to plans and specifications even with supervision and instruction.

MARKING SHEET

ET 110 Basic Electrical Wiring for Non-Majors
INSTALL ELECTRICAL WIRING OF A SINGLE FAMILY DWELLING UNIT (SKELETON HOUSE)

Name of student: _____ Date: _____

CLO 2 – MEASURE UNKNOWN ELECTRICAL QUANTITIES USING ELECTRICAL MEASURING INSTRUMENT

CRITERIA	ALLOTED 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	ALLOTED 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 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			**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			

CLO 4 – INSTALL LIGHTING FIXTURES ACCORDING TO PLANS AND SPECIFICATIONS

CRITERIA	ALLOTED POINTS	GAINED POINTS	FINAL GRADE
ACCURACY	**10 or 1**		**35%**
1. Turning S_3X1 in "UP" position will turn Lamp X ON	10 or 1		Average of gained points X 10 X 35%
2. Turning S_3X2 in "UP" position will turn Lamp X OFF	10 or 1		
3. Turning S_B in "ON" position will turn Lamps B ON	10 or 1		
4. Turning S_B in "OFF" position will turn Lamps B OFF	10 or 1		
5. Turning S_C in "ON" position will turn Lamps C ON	10 or 1		
6. Turning S_C in "OFF" position will turn Lamps C OFF	10 or 1		
7. Turning S_D in "ON" position will turn Lamps D ON	10 or 1		
8. Turning S_D in "OFF" position will turn Lamps D OFF	10 or 1		
9. Turning S_E in "ON" position will turn Lamps E ON	10 or 1		
10. Turning S_E in "OFF" position will turn Lamps E OFF	10 or 1		
11. Turning S_F in "ON" position will turn Lamps F ON	10 or 1		
12. Turning S_F in "OFF" position will turn Lamps F OFF	10 or 1		
13. Turning S_G in "ON" position will turn Lamps G ON	10 or 1		
14. Turning S_G in "OFF" position will turn Lamps G OFF	10 or 1		
15. Turning S_3Y1 in "UP" position will turn Lamp Y ON	10 or 1		
16. Turning S_3Y2 in "UP" position will turn Lamp Y OFF	10 or 1		
WORKMANSHIP (QUALITY OF WORK/APPEARANCE)			**25%**
1. Lighting fixtures are installed according to plans and specifications	10		Average of gained points times 10 times 25%
2. Lighting fixtures are securely fastened on the ceiling cavity	10		
SAFETY, PROPER USED OF TOOLS, MATERIALS AND EQUIPMENT			**20%**
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			**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			

CLO 5 – INSTALL ELECTRICAL WIRING FOR SINGLE FAMILY DWELLING UNIT USING SHEATHED NON-METALLIC CABLE ACCORDING TO PLANS AND SPECIFICATIONS

CRITERIA	ALLOTED POINTS	GAINED POINTS	FINAL GRADE
ACCURACY	**10 or 1**		**35%**
1. The voltage measured in convenience outlet 1 is 120VAC	10 or 1		Average of gained points X 10 X 35%
2. The voltage measured in convenience outlet 2 is 120VAC	10 or 1		
3. The size of wire used in lighting circuit is #14 AWG	10 or 1		
4. The size of wire used in power circuit is #12 AWG	10 or 1		
5. Turning OFF 15A circuit protection turns all the lamps OFF	10 or 1		
6. Turning OFF 20A circuit protection turns all the CO OFF	10 or 1		
7. Turning OFF 100A main circuit protection turns OFF all the			

branch circuit			
WORKMANSHIP (QUALITY OF WORK/APPEARANCE)			**25%**
1. Electrical components are installed according to measurements given.	10		Average of gained points times 10 times 25%
2. Electrical boxes are securely fastened on wiring boards	10		
3. Electrical boxes are aligned and leveled according to plans and specifications	10		
4. Sheathed non-metallic cable is bent in accordance with NEC standards	10		
5. Sheathed non-metallic cable is supported according to NEC standards	10		
6. Electrical boxes entry points are secured by appropriate fittings	10		
7. Electrical components are installed according to measurements given.	10		
SAFETY, PROPER USED OF TOOLS, MATERIALS AND EQUIPMENT			**20%**
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			**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 110 Basic Electrical Wiring for Non-Majors
INSTALL ELECTRICAL WIRING OF A SINGLE FAMILY DWELLING UNIT (SKELETON HOUSE)

CRITERIA
ACCURACY
CLO 2 — Measure unknown electrical quantities using electrical measuring instrument CLO 3 — Splice/join electrical conductors according to national electrical code CLO 4 — Install lighting fixtures according to plans and specifications CLO 5 — Install electrical wiring for single family dwelling unit using sheathed non-metallic cable according to plans and specifications
• *10 points will be awarded if the criteria on each CLO are met, 1 point if the criteria are not met.*
QUALITY OF WORK (WORKMANSHIP)
CLO 3 — SPLICE/JOIN ELECTRICAL CONDUCTORS ACCORDING TO NATIONAL ELECTRICAL CODE
1. Joined/Spliced conductors are free from groove or nick to ensure current carrying capacity is not lessened. • 2 points deduction for every grove or nick found in joints and splice. 2. Joints and splices contain appropriate number of necessary twists and turns. • 2 points deduction for every joint or splice with inappropriate number of twits/turns 3. Joints and splices twists and turns are done evenly and neatly. • 2 points deduction for every uneven/untidy twist/turn on the joint/splice
CLO 4 — INSTALL LIGHTING FIXTURES ACCORDING TO PLANS AND SPECIFICATIONS
1. Lighting fixtures are installed according to plans and specifications • 2 points deduction for every lighting fixture installed not in accordance with the plans and specifications 2. Lighting fixtures are securely fastened on the ceiling cavity. • 2 points deduction for every lighting fixture that are not securely fastened.
CLO 5 — INSTALL ELECTRICAL WIRING FOR SINGLE FAMILY DWELLING UNIT USING SHEATHED NON-METALLIC CABLE ACCORDING TO PLANS AND SPECIFICATIONS
1. Electrical components are installed according to measurements given. • 2 points is for every improperly insulated splices and joints 2. Electrical boxes are securely fastened on wiring boards • 2 points is for every improperly insulated splices and joints 3. Electrical boxes are aligned and leveled according to plans and specifications • 2 points is for every improperly insulated splices and joints 4. Sheathed non-metallic cable is bent in accordance with NEC standards • 2 points is for every improperly insulated splices and joints 5. Sheathed non-metallic cable is supported according to NEC standards • 2 points is for every improperly insulated splices and joints 6. Electrical boxes entry points are secured by appropriate fittings • 2 points is for every improperly insulated splices and joints 7. Electrical components are installed according to measurements given. • 2 points is for every improperly insulated splices and joints
SAFETY, PROPER USED OF TOOLS, MATERIALS AND EQUIPMENT
1. Area is cleaned upon completion of the job • 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. • 2 points deduction for every improper use of tools and/or equipment 3. Materials are used properly • 2 points deduction for every improper use of materials 4. Safety procedure is strictly observed within the duration of work • 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