### **Course Outline**

### Microcontroller Technology

Course Title

GE 116
Dep't. & Course No.

#### I. COURSE DESCRIPTION

This course is designed to provide students with the knowledge and skills to diagnose, repair and operate a microcontroller devices and equipments employed in various industrial applications. It includes programming, wiring, and interfacing for different I/O circuits and devices.

## II. SEMESTER CREDITS: 3 Credits

$$\frac{2}{\text{Lecture}}$$
  $\frac{3}{\text{Lag}}$ 

Total

#### IV. PREREQUISITE: NONE

#### V. STUDENT LEARNING OUTCOMES:

VI. COURSE CONTENT

At the end of the semester, the student with a combined accuracy of 65% should be able to:

- Draw the architectural design of Microcontroller.
- List the different application of Microcontroller.
- 3. List the steps in assembling the microcontroller.
- Discuss the procedures in initializing the operation of Microcontroller
- Explain the how the architectural design of microcontroller works.
- Discuss the steps in repairing the Microcontroller.

#### A. Introduction to Microcontroller

- 1. The MPU Design
- The Architecture of Microcontroller

# B. Getting Started with Microcontroller.

- 1. Application
- 2. Hardware and Software Requirements
- 3. Hardware and Software Setup

#### C. Assembly

- 1. Parts mounting
- 2. Soldering and wirings

#### D. Testing

- 1. Loading the test program
- 2. Alignment and Adjustment

#### E. Microcontroller Operation

1. Five Basic Parts Operation

## F. Safety Rules in Troubleshooting the Microcontroller

- 1. ESD
- Replacing the Chip

- 7. Discuss the importance of four essential signals of microcontroller.
- G. Four Essential Signals to Check.
  - 1. Reset Signal
  - 2. Clock Signal
  - 3. Power Signal
  - 4. Standby Signal
- 8. Write programs for microcontroller
- H. Controlling the LED
- I. Integrating Input Pushbutton Switch
- J. Controlling the Motion
- K. Measuring the Rotation
- L. Controlling the Digital Display
- M. Measuring the light
- N. Controlling the frequency and sound.
- 9. Integrate Input/output devices to microcontroller.
- O. Interface Driver Circuit
- P. Controlling the current flow with a transistor
- Q. Introducing The Digital Potentiometer
- R. Controlling the AC motor.
- S. Controlling the AC Lamp

#### VII. MATERIALS AND EQUIPMENT

Complete Set of Paralax Basic Stamp 2 Microcontroller Paralax Stamp Version 2.2 Software PIC Microcontroller Assembly for PIC microcontroller Version 3 Software AC and DC Motors. Relays and Contactors AC and DC Lamps

#### VIII. TEXT AND REFERENCES

A. Required Text: Andy Lindsay, What is a Microcontroller. USA, Parallax Inc. 2011.

#### IX. METHOD OF INSTRUCTION

- B. Lecture for the presentation of theory
- C. Demonstration for the presentation of skills
- D. Discussion and questioning for test of understanding
- E. Practical Experiments for emphasis of known principles
- F. Project Construction

### X. METHOD OF EVALUATION

- A. Lecture presentation will be tested using the written test Laboratory evaluation will be rated based on the following criteria.
  - 1. Accuracy
  - 2. Appearance
  - 3. Completion
  - 4. Techniques
- B. The components with corresponding weight in percent included in the Computation of Midterm and Final grades are:

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

The transmutation of total percent to letter grade is as follows:

90% -	100%	 	 	 A
80% -	89%	 	 	 В
70% -	79%	 	 	 C
65% -	69%	 	 	 D
0 -	64%	 	 	 . F

# TASK LISTING SHEET

# MICROPROCESSOR TECHNOLOGY

Course Title

GE 116
Dep't. & Course No.

 $\begin{array}{cccc} \text{Credits:} & \underline{2}_{-} & \underline{1}_{-} & \underline{48} \\ & \text{Lec} & \text{Lab} & \text{Total Lab Hrs} \end{array}$ 

Laboratory Objectives	Time Allotment
1. Assemble a microcontroller circuit board.	9
1. Prepare the materials for the microcontroller assembly	
2. Mount and solder the microcontroller board	
3. Test the microcontroller operation	
2. Troubleshoot and repair a microcontroller Circuit	
Trace the architecture and pin configuration of the microcontroller	9
Trace the pre ence of four e sential signal in microcontroller	
3. Replace defective parts of the microcontroller.	
4. Develop programs for a microcontroller circuit	18
Controlling the LED	
2. Integrating Input Pushbutton Switch	
3. Controlling the Motion	
4. Measuring the Rotation	
5. Controlling the Digital Display	
6. Measuring the light	·
7. Controlling the frequency and sound	
3. Interface Input/output devices to microcontroller Circuit.	12
Prepare the I/O devices	
2. Construct I/O interface circuit board	
<ol> <li>Connect and wire the I/O interface circuit board to Microcontroller/</li> </ol>	
4. Test the operation using the develop program	

# Palau Community College GE 116- MICROCONTROLLER TECHNOLOGY 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

2 Below Average

4 Above-Average

1 Unacceptable

3 Average

#### CLO 1: Assemble a microcontroller circuit.

5	Determine the different components to be place on the board, mount all the components in their proper places, solder and wire all the connections and test the operation of the circuit with 90% - 100% accuracy.
4	Determine the different components to be place on the board, mount all the components in their proper places, solder and wire all the connections and test the operation of the circuit with 80% - 89% accuracy.
3	Determine the different components to be place on the board, mount all the components in their proper places, solder and wire all the connections and test the operation of the circuit with 70% - 79% accuracy.
2	Determine the different components to be place on the board, mount all the components in their proper places, solder and wire all the connections and test the operation of the circuit with 65% - 69% accuracy.
1	Determine the different components to be place on the board, mount all the components in their proper places, solder and wire all the connections and test the operation of the circuit with below 65% accuracy.

# CLO 2: Troubleshoot and repair a microcontroller circuit.

5	Identify the source of troubles, locate the cause of troubles, repair the specific cause of trouble and test the operation with no instruction or assistance from the supervisor.
4	Identify the source of troubles, locate the cause of troubles, repair the specific cause of trouble and test the operation with no instruction but limited supervision.
3	Identify the source of troubles, locate the cause of troubles, repair the specific cause of trouble and test the operation with some instruction and more than limited supervision.
2	Identify the source of troubles, locate the cause of troubles, repair the specific cause of trouble and test the operation with considerable instruction and close supervision.
1	Unable to troubleshoot and repair a microcontroller circuit even with close instruction and supervision. Little to no experience and knowledge in the area.

# CLO 3: Develop programs for a microcontroller circuit.

5	Write different programs to control and measure different input/output devices with 90% to 100% accuracy.
4	Write different programs to control and measure different input/output devices with 80% to 89% accuracy.
3	Write different programs to control and measure different input/output devices with 70% to 79% accuracy.
2	Write different programs to control and measure different input/output devices with 65% to 69% accuracy.
1	Write different programs to control and measure different input/output devices with below 65% accuracy.

# CLO 4: Interface Input/output devices to microcontroller circuit

5	Hook up input/output devices to microcontroller circuit and operate it with no instruction or assistance from the supervisor.
4	Hook up input/output devices to microcontroller circuit and operate it with no instruction but limited supervision.
3	Hook up input/output devices to microcontroller circuit and operate it with some instruction and more than limited supervision.
2	Hook up input/output devices to microcontroller circuit and operate it with considerable instruction and close supervision.
1	Unable to interface input/output devices to microcontroller circuit even with close instruction and supervision. Little to no experience and knowledge in the area.