Course Outline

Robotic 2
Course Title

GE 212
Dep't. & Course No.

I. COURSE DESCRIPTION

This course will give the students a unique experience in mechanical assembly and programing of a Quad Copter robot (flying drone) that can be send in aerial space to do Land Mapping and Surveying, Real-estate Observations and Aerial Video. It also includes wirings, airborne video system installation and sending to an actual mission .

II. SEMESTER CREDITS: 3 Credits

III. CONTACT HOURS PER WEEK: 2 Lecture 3 Lab 5 Total

IV. PREREQUISITE: GE116,& GE128

V. STUDENT LEARNING OUTCOMES:

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

1. Discuss the introductory information for Quadcopters operation.
2. Explain the flight dynamics of Quadcopters
3. Identify the different parts of ELEV-8 Quadcopter and its' function.
4. Discuss the procedures in buiding the ELEV-8 v2 Quadcopter.
5. Discuss how to program the operation the Quadcopter with Parallax Propeller Chip
6. Explain the propulsion system of Quadcopter.
7. Discuss the integration of remote control and GPS system to the Quadcopter
8. Discuss the integration airborne video system to the Quadcopter.
9. Discuss the test and tune-up procedures of the Quadcopter.

VI. COURSE CONTENT

A. Introduction to Quadcopters

B.. Quadcopter Flight Dynamics

C.. Building the ELEV-8

D.. Programming the Parallax Propeller Chip

E.. Quadcopter Propulsions

F. Radio-Controlled Systems and Telemetry

G. Servo Motors and Extending the Servo Control System

H. GPS and a Real-Time Situational Display

I..Airborne Video System

J..Training Tutorial and Performance Check

K..Enhancement and future project

L. Land Mapping and Surveying

M. Real State Observation and Aerial Video.

VII. MATERIALS AND EQUIPMENT

- 1 - BASIC Stamp Board of Education Full (USB)
- 1 - ELEV-8 v2 Quadcopter Kit (#80200)
- 1 - Rechargeable Lithium Polymer (LiPo) battery
- 1 - Tenergy TB6B Balance Charger (#752-00009
- 1 - Tarot T-2D Brushless Gimbal
- 1 - GoPro Hero 3 or 3+ Camera
- 10" - U-Channel Aluminum Extrusion, appx 0.65" wide by 0.5" tall (sold in some hardware stores as "plywood edge trim")
- 2 - 3.5mm Bullet Connector, Male
- 2 - 3/16" Heat-Shrink Tubing, ½" (1 cm) long
- 6 - Machine Screw, #4-40 x ⅜", Pan Head
- 2 - Internal Lock Washer, #4 OR Locktite Threadlocker
- 1 - Locknut, #4
- 2 - Standoff, #4-40 x ⅞"
- 1 - Servo Extension (3-wire) Cable, Male to Female, 4 to 8" (optional)

VI. TEXT AND REFERENCES

A. Required Text:
Donald Norris, **Build Your Own Quadcopter**, 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 method. 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	10%
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% ..... B
70% - 79% C
65% - 69% ..... D
0 - 64% ..... F

Form NC-2

TASK LISTING SHEET

INDUSTRIAL CONTROL TECHNOLOGY
Course Title

GE 212
Dep't. & Course No.

Credits: 2 Lec 3 Lab 48 Total Lab Hrs

Laboratory Objectives	***Time Allotment***
1. Assemble the Quadcopter (Flying Drone)	12hrs
1. Building the ELEV-8 2. Wiring 3. Install the video system	
2. Program the Operation of Quadcopter	12hrs
1. Programming the Parallax Propeller Chip 2. Quadcopter Propulsors	
3. Integrate Remote Control and GPS	12hrs
1. Install Radio-Controlled Systems and Telemetry 2. Control Servo Motors and Extending the Servo Control System 3. Incorporate GPS and a Real-Time Situational Display	
4. Test the Flight Operation	12hrs
1. Check the Performance 2. Land Mapping and Surveying 3. Real State Observation and Aerial Video.	

Palau Community College
GE 212 Robotic 2
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

CLO 1: Assemble the Quadcopter

5	Demonstrate knowledge and skills in building the ELEV-8 robot, wiring, and installing the video system of the robot with no instruction or assistance from the supervisor.
4	Demonstrate knowledge and skills in building the ELEV-8 robot, wiring, and installing the video system of the robot with no instruction but limited supervision..
3	Demonstrate knowledge and skills in building the ELEV-8 robot, wiring, and installing the video system of the robot with some instruction and more than limited supervision..
2	Demonstrate knowledge and skills in building the ELEV-8 robot, wiring, and installing the video system of the robot with considerable instruction and close supervision.
1	Unable to build the ELEV-8 robot, wiring, and installing the video system of the robot even with close instruction and supervision. Little to no experience and knowledge in the area.

CLO 2: Program the Operation of Quadcopter.

5	Demonstrate knowledge and skills in programing the operation of the robot with no instruction or assistance from the supervisor.
4	Demonstrate knowledge and skills in programing the operation of the robot with no instruction but limited supervision..
3	Demonstrate knowledge and skills in programing the operation of the robot with some instruction and more than limited supervision..
2	Demonstrate knowledge and skills in programing the operation of the robot with considerable instruction and close supervision.
1	Unable to program the operation of the robot even with close instruction and supervision. Little to no experience and knowledge in the area.

CLO 3: Integrate Remote Control and GPS.

5	Demonstrate knowledge and skills in integrating remote control and GPS system in the robot with no instruction or assistance from the supervisor.
4	Demonstrate knowledge and skills in integrating remote control and GPS system in the robot with no instruction but limited supervision.
3	Demonstrate knowledge and skills in integrating remote control and GPS system in the robot with some instruction and more than limited supervision.
2	Demonstrate knowledge and skills in integrating remote control and GPS system in the robot with considerable instruction and close supervision.
1	Unable to integrate remote control and GPS system in the robot even with close instruction and supervision. Little to no experience and knowledge in the area.

CLO 4: Test the Flight Operation.

5	Demonstrate knowledge and skills in test flight operation of the robot with no instruction or assistance from the supervisor.
4	Demonstrate knowledge and skills in test flight operation of the robot with no instruction but limited supervision.
3	Demonstrate knowledge and skills in test flight operation of the robot with some instruction and more than limited supervision.
2	Demonstrate knowledge and skills in test flight operation of the robot with considerable instruction and close supervision.
1	Unable to test the flight operation of the robot even with close instruction and supervision. Little to no experience and knowledge in the area.