College of San Mateo
Official Course Outline

1. **COURSE ID:** PHYS 130 **TITLE:** Introduction to Drone-based Science and Engineering
   Units: 3.0 units **Hours/Semester:** 32.0-36.0 Lecture hours; 48.0-54.0 Lab hours; and 64.0-72.0 Homework hours
   Method of Grading: Letter Grade Only

2. **COURSE DESIGNATION:**
   Degree Credit
   Transfer credit: CSU
   AA/AS Degree Requirements:
   CSM - GENERAL EDUCATION REQUIREMENTS: E2c.Communication and Analytical Thinking
   CSM - GENERAL EDUCATION REQUIREMENTS: E5a. Natural Science

3. **COURSE DESCRIPTIONS:**
   Catalog Description:
   This course gives students a hands-on introduction to drones, their science and engineering, and their use as tools for the collection of scientific data. Students learn design, fabrication, and programming through the construction and/or modification of drones equipped with scientific instrumentation. Students also learn techniques for flying drones legally and ethically for data acquisition, and for analysis and reporting of scientific data collected by drones. Students will use skills typically covered in many elementary algebra courses.

4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**
   Upon successful completion of this course, a student will meet the following outcomes:
   1. Design an experiment that involves quantitative drone-based data collection and analysis.
   2. Design, program, and implement a circuit-level quantitative data acquisition system to be used during the flight of a drone.
   3. Construct and/or modify a drone to support data collection.
   4. Analyze and report on the acquired data.
   5. Fly drones in a safe, legal, and ethical manner.

5. **SPECIFIC INSTRUCTIONAL OBJECTIVES:**
   Upon successful completion of this course, a student will be able to:
   1. Design an experiment that involves quantitative drone-based data collection and analysis.
   2. Design, program, and implement a circuit-level quantitative data acquisition system to be used during the flight of a drone.
   3. Construct and/or modify a drone to support data collection.
   4. Analyze and report on the acquired data.
   5. Fly drones in a safe, legal, and ethical manner.

6. **COURSE CONTENT:**
   Lecture Content:
   Introduction to experimental design.
   Circuit design basics.
   Sensors and data acquisition.
   Microcontroller programming.
   Drone construction and modification.
   Drone flight safety, regulations, and ethics.
   Data analysis.
   Data reporting and presentation.
   Lab Content:
   Programming practice.
   Circuit construction and debugging.
   Sensor calibration and operation.
   Unmanned aerial vehicle construction.
   Vehicle launch.
   Data analysis and reporting.

7. **REPRESENTATIVE METHODS OF INSTRUCTION:**
   Typical methods of instruction may include:
   A. Lecture
   B. Lab
   C. Activity
   D. Experiments

8. **REPRESENTATIVE ASSIGNMENTS**
   Representative assignments in this course may include, but are not limited to the following:
   Writing Assignments:
   Written project proposal describing proposed experiment.
   Written report describing experimental design and results.

   Reading Assignments:
   Background and technical reading regarding drones.
   Background and technical reading regarding payload design.
   Background and technical reading regarding experimental design.

   Other Outside Assignments:
   Skill-building homework assignments
   Experimental design
   Programming
   Data analysis
   Poster and/or oral presentation preparation

9. **REPRESENTATIVE METHODS OF EVALUATION**
   Representative methods of evaluation may include:
   A. Class Participation
   B. Class Performance
   C. Class Work
   D. Exams/Tests
   E. Group Projects
   F. Homework
   G. Lab Activities
   H. Oral Presentation
   I. Papers
   J. Projects
   K. Quizzes
   L. Research Projects

10. **REPRESENTATIVE TEXT(S):**
    Possible textbooks include:
    A. McGriffy, David. *Make: Drones: Teach an Arduino to Fly*, 1 ed. San Francisco: Maker Media Inc., 2017
    B. Schmuller, Joseph. *Statistical Analysis with Excel for Dummies*, 4 ed. Hoboken: John Wiley & Sons, Inc., 2016

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Course Originator: Alex Wong