1. Department, Course Number, and Course Title:

MECHANICAL ENGINEERING

CE/ME413 FLUID MECHANICS LABORATORY II

2. Designation:

Required	☑	Elective	☐
Lower Division	☐	Upper Division	☑

3. Course Description: Experiments on subsonic and supersonic flow, pumps, turbines, fans and unsteady flow

4. Prerequisites: CE/ME 313 (Fluid Mechanics Laboratory I), Prerequisite or corequisite: CE 387 (Hydraulics) or ME 408 (Fluid Mechanics II)

5. Text and Materials: Laboratory manual provided by instructor

6. Course Objectives: The students will learn to operate wind tunnels and modern data- acquisition system, and conduct tests to verify airfoil theory, and to obtain aerodynamic characteristics of basic shapes, wings, aircraft, and land vehicles. Visualization of flow past these objects in a smoke tunnel is also introduced.

Course Outcomes

- The ability to use wind tunnels to observe air flow and to measure aerodynamic forces.
- The ability to collect and analyze test data with a data-acquisition system.
- Verification of typical characteristics of airfoils and wings.
- The ability to use computers for data analysis, empirical equations and presentation.
- The ability to work individually and as a team
- The ability to communicate with written reports and oral presentation.

7. Topics Covered: (in Order of Presentation)

- Introduction to wind tunnel testing
- Aerodynamic Drag on 2-D Objects
- Aerodynamic Drag on 3-D Objects
- Aerodynamic Characteristics of an Airfoil
- Aerodynamic Characteristics of a Wing
- Effect of Winglets
- Aerodynamic Characteristics of an Aircraft
- Aerodynamic Characteristics of Solar Car Designs
- Aerodynamic Thrust of a Propeller
- Final Exam/Oral Presentation

8. Class Schedule:

Number of Sessions per week:	1
Duration of each session:	2 hours 50 minute

9. Contribution of course to meeting the professional component:

This course is part of the 1 unit of laboratory elective in Mechanical Engineering program.

Engineering Laboratory	1 unit

10. Relationship of course to program objectives:

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes: • • •

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)

- a knowledge of measurement techniques

Skill outcomes:

- an ability to design and conduct experiments as well as to analyze and interpret data (abet b)
- an ability to function on multidisciplinary teams (abet e)
- an ability to communicate effectively (abet g)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of professional and ethical responsibility (abet f)
- a desire to be a flexible and adaptable team player (collaborative attitude)

11. Prepared by: Chivey Wu 05/2005