1. Department, Course Number, and Course Title:

MECHANICAL ENGINEERING

ME 412 STRENGTH OF MATERIALS LABORATORY II

2. Designation:

Required	☐	Elective	☑
Lower Division	☐	Upper Division	☑

3. Course Description: Fatigue tests of materials and connections, stress concentration, photo-elasticity, creep tests, shock and vibration tests, combined stresses, and individual projects.

4. Prerequisites: CE/ME 312 (Strength of Materials Laboratory I), CE 360 (Structural Mechanics I) or CE 323 (Machine Design I).

5. Text and Materials: Strength of Materials Lab II Notes, by Profs. George E. Mann and Alfred H. Fritz, CSULA.

6. Course Objectives: Seniors in M.E. will learn and understand concepts and principles associated with advanced experimental methods used to determine stress, strain and strength for mechanical components.

Course Outcomes

- Understand the principles and concepts of photoelasticity.
- Ability to operate circular polariscope, and acquire and interpret photoealstic data to determine stress concentrations and contact stresses.
- Understand the principles and concepts of resistance strain gages.
- Ability to operate universal testing machine to acquire and then interpret strain-gage data for determining the stresses in a compressed split-ring.
- Ability to acquire and interpret strain-gage data to determine the shear center for a channel beam section.
- Ability to operate universal testing machine to acquire load and strain-gage data to determine the compressive stress-strain diagram for an aluminum specimen.
- Ability to operate universal testing machine to determine and interpret the elastic and inelastic buckling loads of aluminum columns.
- Ability to operate universal testing machine to acquire and then interpret strain-gage data for determining the mechanical behavior of adhesive-bonded joints.
- Ability to operate a rotating-beam fatigue testing machine to acquire and then interpret fatigue data for specimens with and without stress concentrations.

7. Topics Covered: (in Order of Presentation)

- Photoelasticity: Determination of fringe constant from beam in pure bending. Report required
- Photoelasticity: Determination of fringe constant from disk in compression; determination of stresses in compressed split-ring. Report required.
- Photoelasticity: Determination of stress concentrations and contact stresses. Report required.
- Strain Gages: Determi nation of stresses in compressed split-ring. Report required.
- Strain Gages: Determination of the shear center for a channel beam section. Report required
- Elastic and inelastic buckling of columns. Report required.
- Strain Gages: Behavior of adhesive-bonded single-lap and scarf joints. Report required
- Fatigue testing. Report required

8. Class Schedule:

Number of Sessions per week:	1
Duration of each session:	3 hours

9. Contribution of course to meeting the professional component:

This course is part of the 25 units of upper division technical electives required for the mechanical engineering program.

Engineering Science	1 units

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: Stephen F. Felszeghy 05/2005