

**University Of California, Berkeley**  
**Department of Mechanical Engineering**

**ME 190A: Rapid Prototyping of Mechanical Systems (2 units)**

**Undergraduate Elective**

*Syllabus*

**CATALOG DESCRIPTION**

Design, optimization, rapid prototyping, assembly, test and evaluation of mechanical components and sub-systems used in mechanical systems.

**COURSE PREREQUISITES**

ENG 26

**TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL**

None

**COURSE OBJECTIVES**

Provide students with enhanced experiences in modern rapid prototyping of mechanical components and subsystems essential in the construction of mechanical systems. Enable students to work in small, intimate teams to solve design and optimization problems, then use rapid prototyping techniques to build and evaluate the designs. Afford students instructor-provided problems or, with approval, student-designed projects. Integrate the design, prototyping, test and evaluation process to achieve working mechanical systems that meet optimal goals. Provide experience in working in a team for design, prototyping, test, evaluation and report writing. Give students a basis for communication problem-solving, writing and speaking. Teach students how to communicate effectively to various target groups, including those, such as managers, who may be outside of their field of study.

**DESIRED COURSE OUTCOMES**

By the end of this course, students should: know how to develop a three-dimensional computer model of a mechanical system and fabricate an actual device via rapid prototyping; know how to formulate a design problem such that a successful outcome is likely; know how to set-up and utilize instrumentation to obtain and present experimental data; know how to test the physical mechanical system to determine if the system has met design criteria such as mechanical stiffness, size, weight, and prescribed motion; know how to accommodate limitations in the fabrication process and achieve correct mechanical function of mechanical systems despite fabrication tolerances; know how to improve the mechanical design if the mechanical system does not meet all design criteria; know how to write a summary report that describes this entire process; know how to make presentations and to conduct text edit and review, based on specific measures of excellence in technical communication.

## **TOPICS COVERED**

- Design problem formulation and optimization.
- Solid modeling of mechanical components and systems essential in mechatronic systems.
- Rapid prototyping, fabrication and construction of mechanical components and systems.
- Design of mechanical components and systems to meet performance criteria.
- Test, evaluation and improvement of mechanical components to achieve performance criteria.
- Laboratory test and evaluation of mechanical components and systems for correct operation.
- Oral presentations and use of video/visuals/illustrations.

## **CLASS/LABORATORY SCHEDULE**

One (1) hour per week lecture. Three (3) hours per week laboratory.

## **RELATIONSHIP OF THE COURSE TO ABET PROGRAM OUTCOMES**

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

## **ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES**

Three (3) technical reports and engineering prototypes

Grade will be determined in the following manner

- 20% - 1<sup>st</sup> Report
- 40% - 2<sup>nd</sup> Report
- 40% - 3<sup>rd</sup> Report

## **PERSON(S) WHO PREPARED THIS DESCRIPTION**

Albert P. Pisano, 20 November 2012

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**ABBREVIATED TRANSCRIPT TITLE (19 SPACES MAXIMUM):** RAPID PRO MEC SYS

**TIE CODE:** LABS

**GRADING:** Letter

**SEMESTER OFFERED:** Fall and Spring

**COURSES THAT WILL RESTRICT CREDIT:** None

**INSTRUCTORS:** Professor Albert P. Pisano and Staff

**DURATION OF COURSE:** 15 Weeks

**EST. TOTAL NUMBER OF REQUIRED HRS OF STUDENT WORK PER WEEK:** 6

**IS COURSE REPEATABLE FOR CREDIT?** No

**CROSSLIST:** None