



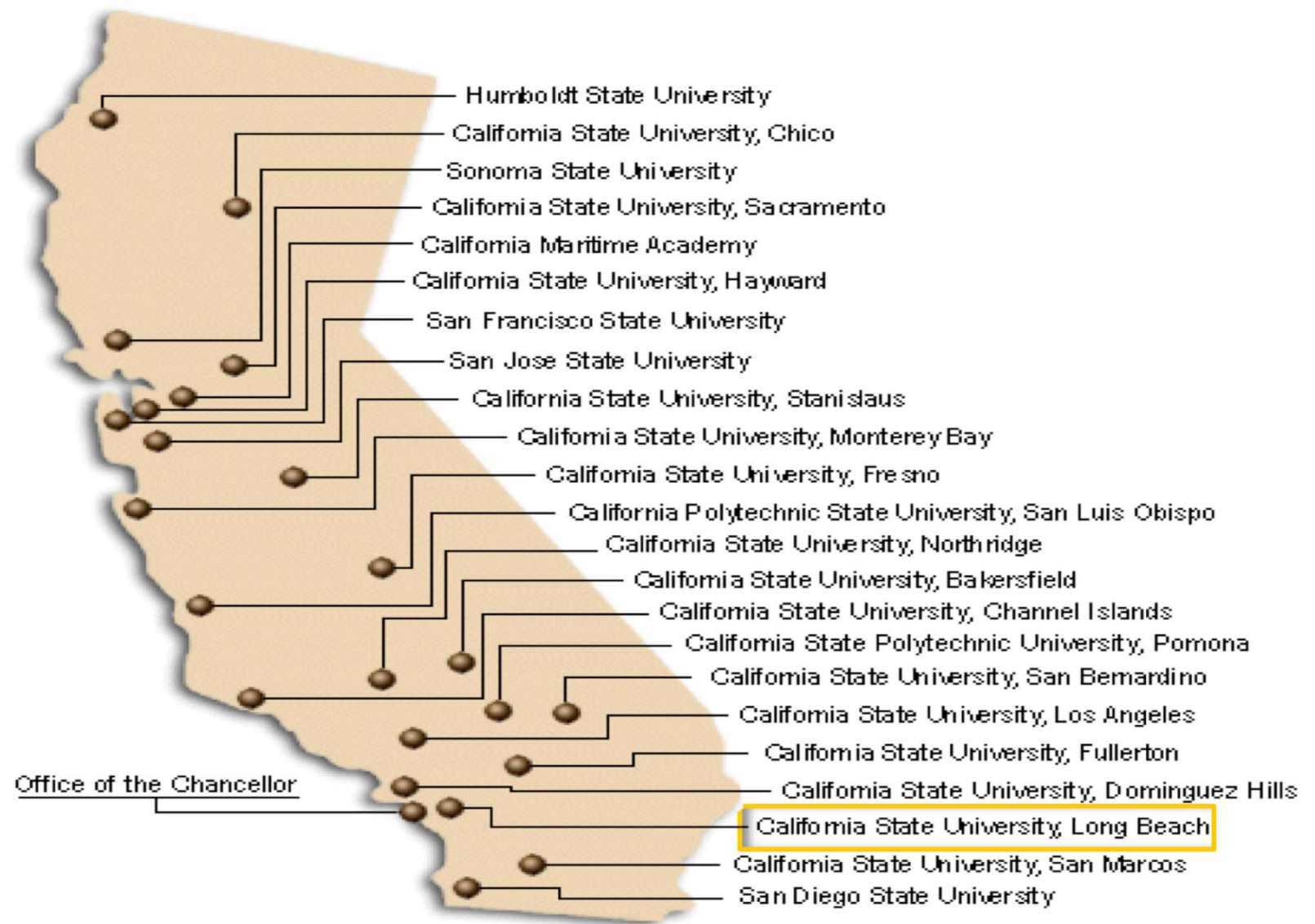
ENGR 100 – Engineering Mathematics

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Mechanical and Aerospace Engineering
CSULB

1st Annual Meeting
National Engineering Mathematics Consortium
June 16, 2009
Austin

CALIFORNIA STATE UNIVERSITY SYSTEM



California State University, Long Beach CSULB

*The
Beach*

34,728 Students attended CSULB in
Fall 2006

CSULB is the largest enrolled
university in the 23-campus CSU
system, and is the second largest
university in California.

Degrees Awarded 1951-2003:
190, 619 UG 39,461 MS

Eight Colleges at CSULB offer 81
baccalaureate degrees (209 programs),
66 master's degrees (98 programs)
and two joint doctoral degrees.



CSULB COLLEGE OF ENGINEERING

- 5 Departments, All accredited.
- B.S. and M.S. Degree given by all departments
- Ph.D. Program-jointly with Claremont Graduate School

First Semester Freshmen in Various Math Classes

Math Classes	COE		Total	
Math 224 (Calculus III)	9	2.5%	15	1.3%
Math 123 (Calculus II)	58	16.5%	110	9.3%
Math 122 (Calculus I)	59	16.8%	111	9.4%
Both Math 113 and 111	103	29.3%	132	11.2%
Math 113 (Algebra)	47	13.4%	379	32%
Math 111 (Trigonometry)	44	12.5%	104	8.8%
MAPB 11 (Int. Algebra)	31	8.8%	331	28%
Total	351	100%	1182	100%

Results (Spring 2009)

- 113 freshmen engineering majors took math 111 and 113 in fall 2008
 - 77 got C or better in both
 - 34 got C or better in only one
 - 22 did not get C in either course
- Of the 77 who got C or better in both
 - 70 enrolled in Math 122 for the spring
 - 80% passed (21% got A)
 - 7 (most probably changed majors)

Why ENGR 100?

- 60% of all engineering freshmen require some math remediation prior to taking Calculus I (Math 122)
- Math Department offers Math 117 which must be taken by students prior to taking Calculus I
- Math 122 is prerequisite to Physics 151 which itself is prerequisite to most engineering courses
- It takes at least 3 semesters before we can offer our courses; by this time most have discouraged and have dropped out of engineering disciplines.
- **ENGR 100 allows freshmen students to start taking engineering courses, from the first semester.**

CSULB Model: ENGR 100

- ENGR 100 (4 units – 3 Lec/1 Lab)
 - Arithmetic, Trigonometry, Geometry, Algebra
 - Matrices and Vectors
 - Complex Analysis
 - Integrals and Derivatives
 - First Order ODE
 - Data Analysis (Statistics, Graphs and Tables)
 - Hands-on Laboratory Experimentations
 - MATLAB

Options Being Considered

- Certify ENGR 100 as a GE course in A.3 (Critical Thinking)
- Substitute ENGR 100 for a Programming Course (MATLAB)
- Offer the Course as a Summer Remedial Course
- Negotiate with math department to be approved as equivalent to Math 111/Math 113

Lectures (3 hours)

1. Review of Arithmetic, Algebra, and Trigonometry (3 weeks)
2. Engineering Units, Approximations, and Estimations (1 week)
3. Statistical Analysis of Experimental Data (2 weeks)
4. Functions, Derivatives, and Integrals (3 weeks)
5. Ordinary Differential Equations (2 weeks)
6. Engineering Applications (3 weeks)

Engineering Applications

- Static Equilibrium
- Kinematics of Falling Bodies
- Mass-Spring System
- Electric Circuits (Thermal and Fluid Analogy)
- Chemical Rate Reactions
- Energy Storage (Batteries, Flywheel, Capacitors, Compressed Air)

Laboratory (3 hours)

- MATLAB
- Hands-on Experiments
- Problem solving
- Analysis of Experimental Data

Conflicting Requirements

- Each department must reduce total units to 120
- Students must still take the MPDT test before they can take Calc-I; This requirement is waved if they enroll in either Math 111/Math 113

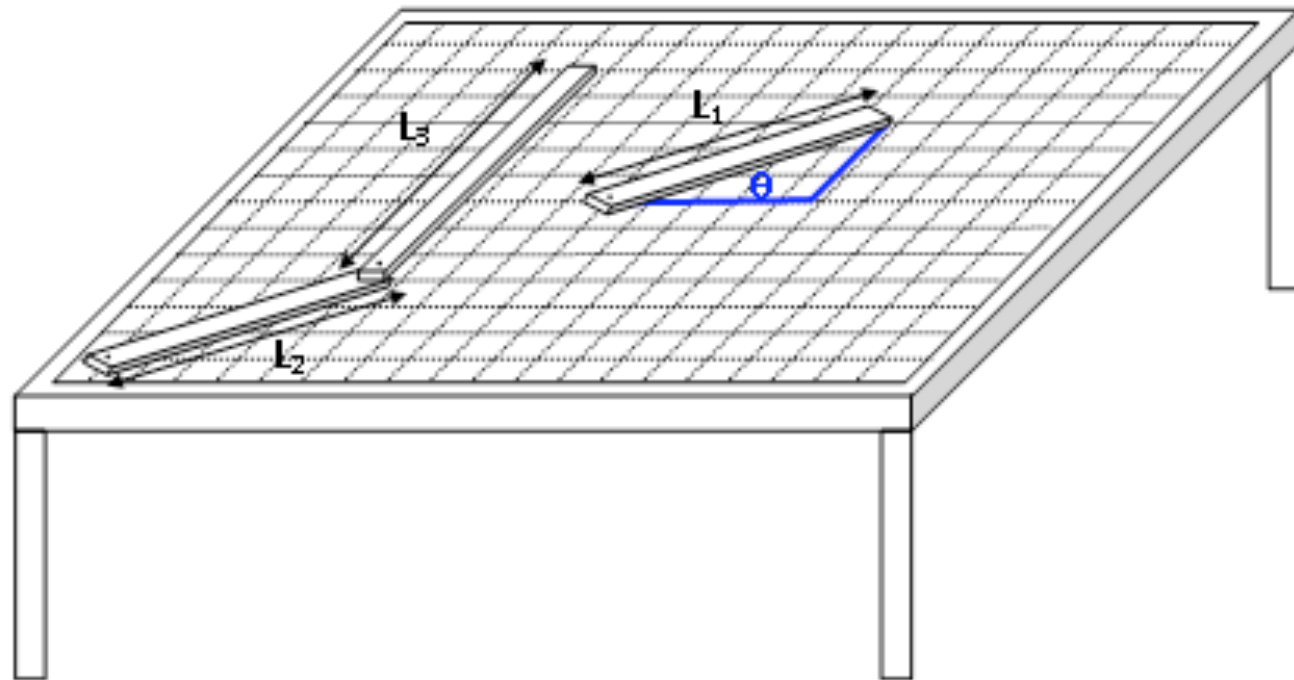
What Have We Done So Far?

- Over 10 Flash Animations
- Course Materials for 3 engineering applications
- Course materials for 3 weeks of classes
- MATLAB Manual
 - Dr. Barry Shahian
- Workbook
- Design of Experiments
 - Dr. Bei Lu
 - Dr. Pannada Marayong

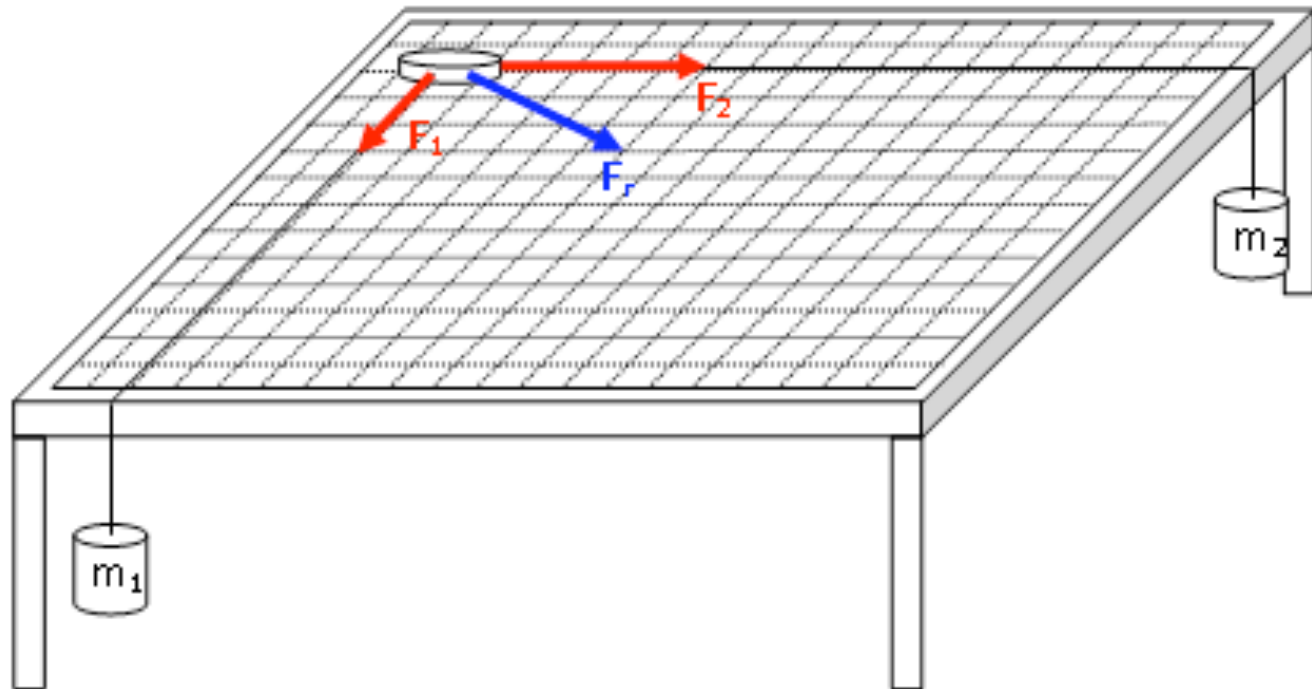
Questions

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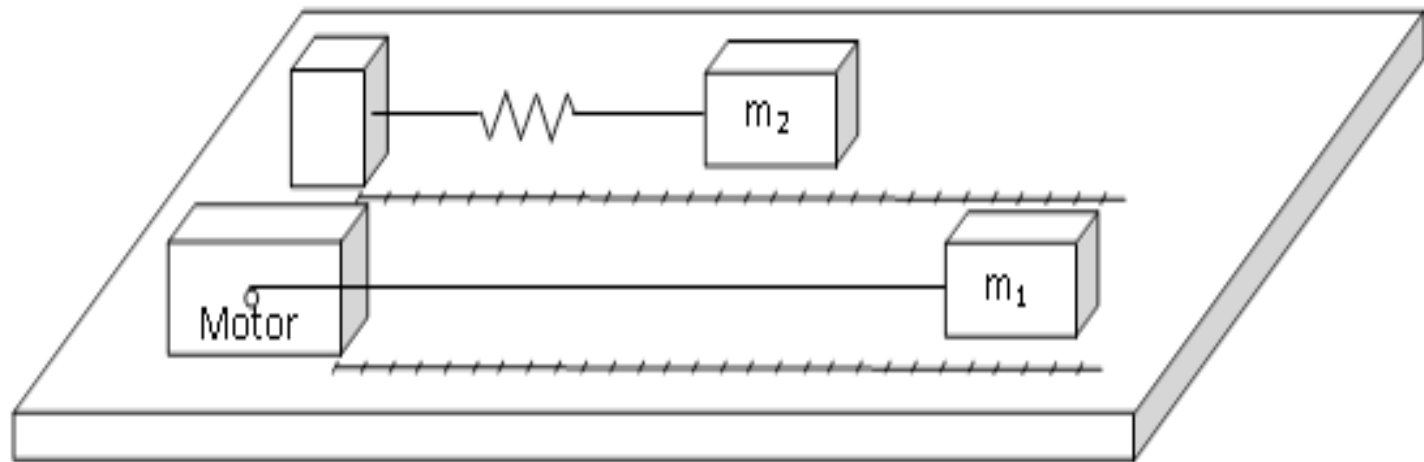
Laboratory activity



Laboratory Activity



Laboratory Activity



Next Year

- More course materials
- Two more lab activities
- Animations, games, and puzzles
- Web hosting
- Offer one to two sections in Spring 2010