Course Syllabus
MAE 342 Principles of Mechanical Design
Spring 2012

Class Time: TTH 1:30-3:20 pm

Description: Applied stress analysis for avoidance of machine element mechanical failure.

Prerequisites: Engineering BS/BSE students; MSE 250 with C or better; MAE 322 with C or better; Pre- or Co-requisite: MAE 318 (with C or better if completed)

Instructor: Dr. K.N. Solanki, ERC 379, (480) 965-1869, kiran.solanki@asu.edu

Office Hours: TTH 3:30-4:30 pm or by appointment

Course site: A course website containing your assignments, solutions, and grades will be on blackboard

Textbook: R.G., Budynas and J.K. Nisbett, Mechanical Engineering Design + Connect, 9th Edition, McGraw-Hill, 2011. ISBN: 978-0-07-794290-8

Recommendated Reading:

- *Machine Elements in Mechanical Design*, 4th ed. by R. L. Mott, Prentice Hall, 2003.
- *Fundamentals of Machine Component Design,* 3rd ed. by R. C. Juvinall and K. M. Marshek, Wiley, 2000.
- *Design of Machinery: An Introduction to the Synthesis and Analysis of Machanisms and Machines,* 3rd ed. by R. L. Norton, Mcgraw-Hill College, 2003.
- *Mechanical Behavior of Materials,* 3rd ed. by N. E. Dowling, Prentice Hall, 2006.
- *Materials Selection in Mechanical Design,* 3rd ed. by M. F. Ashby. Butterworth-Heinemann, 2005.

Homework: Assigned and collected each week. If you wish to dispute a homework or exam grade that you received, you must inform your instructor in writing no more than one week after the assignment of exam was returned.

Grading:

homework	20%
mid exam	25%
project	25%
final exam (comprehensive)	30%

A: 90-100; B: 80-89.9; C: 70-79.9; D: 60-69.9; F: < 60

Attendance Policy:

Attendance is required for all lecture sessions. For university excused absences, students must notify instructor prior to the absence in writing with proofs (if possible). All students are responsible for the materials covered in all lectures.

General Class Policies:

- A set of homework problems will be assigned weekly. Following homework collection, full solutions to all homework problems will be made available via the web.
- No late homework will be accepted

- **Homework must be written and organized in a professional manner or points will be deducted.** When grading your homework, I should be able to trace your thought process throughout the homework problem. Comment your solutions as you work!
- **Staple your homework; failure to staple any assignment will result in a zero grade**
- **Computer Use in Classroom:** Laptops are not to be open during class!
- **Test /Grading Discrepancies:** When tests or assignments are returned to you, you have a period of two weeks to bring any grading discrepancies to me.

ASU Honor Code: "As an Arizona State University student I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do."

For additional information, please visit:
https://provost.asu.edu/academicintegrity

Course Learning Outcomes:

As a result of taking this course you will:

- understand the basic phases of mechanical engineering design;
- recognize potential failure modes which may govern a design;
- quantitatively predict whether failure occur
  - calculate appropriate modulus (measurement parameter)
  - locate appropriate critical strength parameter from the vast number of reference sources available

The following are Core Outcomes for this course. Outcomes are statements describing what you should be able to do at the time of completion of the course. Individual instructors may augment the course with additional outcomes.

Core Outcome	**Mastery Level**
• Students will apply a formal design process, including idea generation and optimization	Application
• Students will formulate design specifications	Application
• Students will participate in a team design experience, and will practice heuristics for productive teaming.	Application
• Students will perform embodiment design	Application

Course Teams:

The projects will be completed in teams. Each team will consist of approximately 5 undergraduate students. Individual project grades will partially depend on the individual contribution and performance. We will try to pick teams on the first day of class.

Feedback:

As a student in my class, you will have the ability to tell me how things are going. EVERY two weeks I will get informal feedback from the class by having everyone answer some questions on a sheet of scratch paper. (1) What do you like about the class, and what did you learn? (2) Was there anything you found particularly boring or hard to understand? In more detail: Do you understand all of the general concepts? Are you lost? Do you have a specific technical question? Am I moving too slowly? Too fast? Was something exciting? Boring? Do you want me to

cover something else interesting to you? Anything goes. The notes are anonymous and I take them seriously - at least most of them!

Course Outline:

1.) failure prevention
2.) stress analysis review: axial loading, bending, torsion, pressurized cylinders
3.) elastic deformation: superposition, effective spring rates
4.) principal stresses and maximum shearing stresses
5.) combined stress theories for static failure
6.) stress concentration
7.) linear elastic fracture mechanics
8.) fatigue
9.) elastic instability (buckling)
10.) shafts
11.) design of gears
12.) rolling-contact bearings
13.) stresses in cylinders
14.) bolted joints
15.) welded joints
16.) impact loading
17.) torsion of noncircular sections
18.) flywheels and high speed rotors
19.) rotating shaft
20.) springs