ME 304 Mechanical Engineering Design (1)

**Course Description**

Introduction to design: design process, problem formulation, engineering model, factors of safety and codes, overall design considerations; Stresses: stress concentration factors, residual stresses; Deflection and Stiffness; Stability and Buckling; Theories of failure: failure under static loading, fatigue loading; fracture mechanics.

**Credits Hours 3**

**Prerequisites Courses**

ME 352 Mechanics of Materials

**Textbooks:**

1. R.C.Hibbeler. Mechanics of Materials, SI 8th Edition.
2. J. E. Shigley, C. R. Mischke and R. G. Budynas, [Mechanical Engineering Design](http://catalogs.mhhe.com/mhhe/viewProductDetails.do?isbn=0072921935), SI 9th Edition, [McGraw Hill](http://www.mhhe.com/), 2008.

**Reference Books**

1. Mechanical Analysis and Design, By Arthur B. Burr, Elsevier
2. Fundamentals of Machine component Design, By Robert Juvinall and Kurt Marshek, Wiley

**Course Topics**

1. Shaft Design
2. Theory of Failure: Static Loading
3. Deflection of Beams and shafts
4. Stability of Structures: Column Buckling
5. Energy Methods
6. Theory of Failure: Dynamic Loading
7. Introduction to Fracture Mechanics

Class/Laboratory Schedule

Three 50 minutes lecture sessions, two 50 minutes tutorials per week.

Computer Applications

Microsoft Office

Laboratory Projects

Term project

Assessment Tools

1. Quizzes + Homework + Attendance = 15 %
2. Project report = 5%
3. MID – I = 20%
4. MID – II = 20%
5. Final Examinations = 40%

**Tutorial Activities:**

1. Introduction to design; Process, Tools, Codes and Standards  ( Chapter 1: Mechanical Engineering Design)
2. **Shaft Design**: (**11.4, 11.13, 11.17, 11.30, 11.44, 11.45, 11.48, 11.52,** R.C. Hibbeler.  Mechanics of Materials)
3. **Theory of Failure for Static Loading**: (**10.69, 10.72, 10.74, 10.76, 10.82, 10.83, 10.90, 10.91, 10.92, 11.39, 11.40, 11.46**; R.C. Hibbeler.  Mechanics of Materials)
4. **Deflection of Beams and Shafts**: (**F12.4, F12.8, F12.11, 12.15, 12.24, 12.38, 12.46, 12.49, 12.55, 12.67, 12.78, 12.86, 12.92, 12.93, 12.95)**; R.C. Hibbeler.  Mechanics of Materials)
5. **Buckling**: **(F13.6, 13.4, 13.19, 13.21, 13.36, 13.37, 13.97, 13.98, 13.99, 13.120, 13.133, 13.134**; R.C. Hibbeler.  Mechanics of Materials)
6. **Energy Methods**: (**14.3, 14.4, 14.11, 14.15, 14.20, 14.21, 14.28, 14.39, 14.41, 14.44, 14.52, 14.54, 14.58, 14.63, 14.150, 14.151, 14.152, 14.153**; R.C. Hibbeler.  Mechanics of Materials)
7. **Fatigue:** ( Crack Growth, life prediction, **6.12, 6.16, 6.17, 6.18, 6.19, 6.20, 6.21**  ; [Mechanical Engineering Design](http://catalogs.mhhe.com/mhhe/viewProductDetails.do?isbn=0072921935))
8. **Fracture Mechanics:** ( KIC Testing; [Mechanical Engineering Design](http://catalogs.mhhe.com/mhhe/viewProductDetails.do?isbn=0072921935))
9. **Contact Stresses**