

MeEn 365 Machine Design

A 'Required' course in Mechanical Engineering Program

2002-2004 Course Description: MeEn 365. MACHINE DESIGN (Credit, 3 Hours) (Lecture 3 hours; Project 2 hours). Part I – Fundamentals of mechanical design, theories of failures, fatigue, and fracture mechanics. Part II – Design of mechanical elements and lubrication theory. Individual/team project.
Prerequisite(s): MeEn 227, Co-Prerequisite(s): MeEn 331

Textbook: *Machine Elements in Mechanical Design*, by R.L. Mott; 1999, 3rd Edition, Prentice Hall. ISBN 0-13-841446-7.

Lecture: See Schedule

Course Coordinator: Samuel Ibekwe, Ph.D., P.E. Associate Professor
Office: Room No.339 P.B.S. Pinchback Engineering Building
Office Hours: MWF 9-10 a.m., 3-4 p.m.; TR 10-11 a.m., 3-4 p.m.
Phone: 771-2525 or 771-2525
E-mail ibekwe@engr.subr.edu

References:

1. *Fundamentals of Machine Component Design*, by R.C. Juvinall, and R. C. Marshek, 3rd Edition, 2000, John Wiley & Son Co.
2. *Mechanical Engineering Design*, by J.E. Shigley and C.R. Mischke, 6th editon, 2001, McGraw-Hill Publishers.

Course Topics:

1. Mechanical Engineering Design in Broad Perspective; Safety, Functions and Design Requirements Ch. 1.
2. Materials in Mechanical Design - Properties Chapter 2.
3. Stress and Deformation Analysis Chapter 3.
4. Combined Stresses and Mohr's Circle Ch. 4.
5. Design for Different Types of Loading Ch. 5.
6. Columns Chapter 6.
7. Power Screws and Ball Screws Chapter 17
8. Fasteners Chapter 18.
9. Springs Chapter 19
10. Machine Frames, Bolted Connections, and Welded Joints Chapter 20
11. Belt Drives and Chain Drives Chapter 7
12. Kinematics of Gears Chapter 8
13. Gear Design Chapters 9, and 10.
14. Keys, Couplings, and Seals Chapter 11.
15. Shaft Design Chapter 12
16. Tolerances and Fits Chapter 13
17. Rolling Contact Bearings Chapter 14
18. Plain Surface Bearings Chapter 16
19. Electric Motors Chapter 21
20. Motion Control: Clutches and Brakes Ch. 22

Prerequisite by topics:

1. MeEn 227 - Strength of Materials Concept of stress and strain, ending and shearing stresses in beams, elastic

2. deflection of beams, torsion, buckling of columns.
3. MeEn 331 - Engineering Materials, Material selection, failure analysis.

Course Objectives: Upon the completion of the course, the student will:

1. Recognize those factors constituting a practical, functional, efficient, and safe mechanical design.
2. Be able to apply the techniques of stress analysis to mechanical designs where deflection, static strength, fatigue strength, properties of materials and safety are considered.
3. Understand the workings of machine components, their design and lubrication; be able to evaluate the physical significance of their design parameters and their effects on the final outcome of design.

COURSE ASSESSMENT:

Course Objective	Intended Educational Outcomes	Means of Assessment	Criteria of Success	Program Edu. Objectives/ ABET (a-k, Me1 – Me6)
Objective 1: To expose students to recognize those factors constituting a practical, functional, efficient, and safe mechanical design.	1.1 Students will demonstrate an understanding of the factors that constitute safe design. 1.2 Students will demonstrate an understanding of factors that influence practical design.	1. Locally developed exams and quizzes 2. Course opinion survey 3. DCE course score 4. BKS Competencies Evaluation	1- 85% passing rate 2- 90% positive response 3- 70% passing rate 4- 80% will achieve critical level of performance (CLP)	Edu. Objective: 1 and 2 ABET: a, e, f, g, h, and Me6
Objective 2: To ensure students are able to apply the techniques of stress analysis to mechanical designs where deflection, static strength, fatigue strength, properties of materials and safety are considered.	2.1 Students will demonstrate an ability to analytically solve for stress and displacement in problems involving machine components, and demonstrate an understanding of the implications. 2.2 Students will demonstrate the ability to identify possible means of mechanical elements' failure and how avert them.	1. Locally developed exams and quizzes 2. Course opinion survey 3. DCE course score 4. BKS Competencies Evaluation	1- 85% passing rate 2- 90% positive response 3- 70% passing rate 4- 80% will achieve critical level of performance (CLP)	Edu. Objective: 1 and 2 ABET: a, e, g, and Me4, Me6
Objective 3: To teach students to understand the workings of machine components, their design and lubrication; be able to evaluate the physical significance of their design parameters and their effects on the final outcome of design.	3.1 Students will demonstrate an understanding of the factors that impact the functions of the machine components. 3.2 Students will demonstrate the ability to design machine elements subject to given criteria or required function.	1. Locally developed exams and quizzes 2. Course opinion survey 3. DCE course score 4. BKS Competencies Evaluation	1- 85% passing rate 2- 90% positive response 3- 70% passing rate 4- 80% will achieve critical level of performance (CLP)	Edu. Objective: 1, 2, and 3 ABET: a, b, e, f, g, h, and Me6

ABET Category Content (as estimated by faculty member who prepared this course description):

Engineering Science: 1.5 credits or 50%
 Engineering Design: 1.5 credits or 50%

Prepared by: Samuel Ibekwe

Date: January 28, 2003