**I. COURSE TITLE:** Machine Design

**COURSE NUMBER:** 2221  **CATALOG PREFIX:** ENDS

**II. PREREQUISITE(S):** ENDS 2201 Engineering Mechanics: Statics

**III. CREDIT HOURS:** 3  **LECTURE HOURS:** 3

**LABORATORY HOURS:** 0 **OBSERVATION HOURS:** 0

**IV. COURSE DESCRIPTION:**

Analysis and design of machine components and assemblies such as:

couplings, bearings, springs, frames, gears, belts, etc. utilizing the

principles of mechanics, kinematics, drafting and strength of materials.

**V. ADOPTED TEXT(S):**

DESIGN OF MACHINE ELEMENTS

8th Edition

Spotts

Pearson

ISBN: 0-13-048989-1

**VI. COURSE OBJECTIVES:**

At the completion of this course the student will know and apply the principles of material science, strength of materials, and statics and dynamics to the design, manufacture and operation of:

A. Shafts

B. Springs

C. Screws

D. Belts, Clutches, Brakes, and Chains

E. Lubrication

F. Bearings

G. Gears and Cams

H. Miscellaneous Machine Elements

I. Principles of Form Synthesis

J. Engineering Materials

**VII. COURSE METHODOLOGY:**

May include but not limited to Lecture and Problem Solving, independent

and group projects, in-class and home assignments, quizzes, and tests.

Problem solving will use both graphical and mathematical methods.

Attendance is required.

**VIII. GRADING**

A = 90 – 100

B = 80 – 89

C = 70 – 79

D = 60 – 69

F = 0 – 59

See college catalog for description of other possible grades.

**IX. COURSE OUTLINE:**

WEEK: MATERIAL:

1. Introduction, definition of mechanics, Fundamental

Principles and Concepts, Units, Conversion of units, Design,

Method of problem solution, introduction/review of mathematics.

1. Working Stresses, Allowable Stress, Loading Conditions

Failure Theories, Factors of Safety

3. Design of Shafts and methods of connection, keys and couplings

Solid vs Hollow Shafts, Power Transmission, Torque & Horsepower

1. Springs – Terminology, Drawing

Compression, Tension, Torsion, Power Springs

Test one

1. Screws - Kinds of Threads, Fastening, Efficiency

Lifting, Power Transmission Screws

1. Belts and Clutches - types of belts

Brakes and Chains – design capacity

1. Welded Connections

Riveted Connections

1. Lubrication – Viscosity, Hydrostatic and Dynamic

Test two

1. Ball and Roller Bearings – construction and loading

Plain Bearings and Sleeve Bearings – materials, advantages

10. Gears – Speed Ratio, Standard Systems, Manufacturing

Gears – Spur and Helical

11. Gears - Bevel

Gears – Worm Gears

12. Machine Elements – Shrink and Press Fits, Flywheels

Gaskets and Seams, Cams

13. Principles of Form Synthesis, Stress patterns, Joint Design

Test Three

14. Engineering Materials – Testing, Steel Types, Treatments

Cost, Machinability, Wear, Corrosion, Casting, Tool Steel

15. Aluminum Alloys, Alloy and Temper Designations, Properties

Magnesium Alloys, Copper Alloys, Alloys for Die Casting.

Week 16: **Final Exam**

**X. OTHER REQUIRED TEXTS, SOFTWARE, AND MATERIALS:**

Scientific calculator

Scale and Protractor

Graphing paper (1/4" squares)

A 3-ring binder for keeping correct solution of assigned problems.

Paper for solution of problems pre-printed with outline will be provided.

Student will need an auxiliary storage device, flash drive or network

home-drive.

**XI. EVALUATION:**

Assignments count – 30% of Final Grade

Attendance counts – 10% of Final Grade

(3) Tests count – 40% of Final Grade

Final counts – 20% of Final Grade

Note well:

Class participation- it is your class, and your participation improves it.

Class attendance- text covers 50% of material, in-class the other 50%.

Evaluation:

Development of ability to analyze mechanics problems and present the results. The retention of general information, data handling skills, and increased speed and accuracy.

**XII. SPECIFIC MANAGEMENT REQUIREMENTS:**

* + All assignments and tests must be turned in on time.
  + Students may work on their own time to complete the assignments.
  + Some group work is encouraged on exercises and assignments.
  + Assignments must be in 3-ring binder.
  + Examinations will include written and graphical components.
  + For credit, all assignments will be completed as scheduled.
  + No test may be taken late without prior approval of instructor.
  + No make-up tests. Read your student handbook.

**XIII. OTHER INFORMATION:**

**FERPA:** Students need to understand that your work may be seen by

others.

Others may see your work when being distributed, during group project

work, or if it is chosen for demonstration purposes.

Students also need to know that there is a strong possibility that your work

May be submitted to other entities for the purpose of plagiarism checks.

**DISABILITIES:** Students with disabilities may contact the Disabilities

Service Office, Central Campus, at 800-628-7722 or 937-393-3431.