Course Objective –
Help students and practitioners become better design related engineering problems solvers through the development of the skills of Synthesis, Inventiveness, Operational analysis and Decision making to successfully use the engineering design practice process through the presentation and application of the methodologies of engineering problem solving together with personal experience in their use in solving design related engineering problems.

Justification -
Today globalization of product development and production is occurring at an unprecedented rate in both developing and industrialized countries. (India, China, Taiwan, etc.). Multinational firms around the world are conducting high tech engineering and research on a 24/7 basis. (the result of global wide-band communication and internet). To maintain technological leadership in this “Flattening World” (Tom Freidman -2007) we must become the source of new products, service ideas and technical innovations. There is a real need for engineering students and practitioners to develop their creative design and problem solving skills to meet this challenge.

Course Content –
1. Introduction
   Engineering in Context
   Design Engineering as a Discipline
   The Engineering Design Process
   Skills of Engineering Design
   Synthesis vs. Analysis
2. Personal traits and Preferences
   Myers Briggs Indicators
   Left brain/ right brain
   Learning styles
3. Creativity
   The Creative Process
   Formal techniques
4. Operational Analysis
   Engineering Analysis Methodology
   Problem Definition and Model Formulation
   Analytical and/or Experimental Analysis
   Computation and Checking
   Evaluation and Communication
   Case Study
5. Design of Power Transmissions
   Definitions and Properties
   Kinematics of Gear Trains
Principles of Power Transmission
Constant Speed Devices
Fluid Couplings and Torque Converters

6. Design for Dynamic Response
   Harmonic Systems
   Forced Vibration and Resonance
   Design for Isolation
   Impact Loading Considerations

7. Design for Deflection
   Comparative Solution Methods
   Mechanical Strain Energy
   Strain Energy in Slender Members
   Castiglione’s Theorem
   Indeterminate Structures

8. Design of Complex Mechanical Sections
   Unsymmetrical Cross Section Beams
   Non Circular Cross Section Shafts
   Simple Reinforced Composites
   Buckling and Stability Considerations

9. Design for Assembly
   Process Definition
   Product and Part Design Guidelines
   Redesign for improvement

10. Design for Strength and Endurance
    Static Failure Criteria
    Fatigue Failure Prediction

Conduct of Class-
   Class Meetings and Lectures -
      Present relevant content materials
      Work sample problems
      Solve and discuss assigned problems
      Engage in interactive learning exercises
   Out of Class Activity -
      Solve assigned engineering problems
      Work in teams on real redesign problem

Grading -
   No exams are scheduled
   Grade based on problem and project solutions

Problem Assignments -
   Eight problems beginning with 2nd week of class
   Solutions due one week after assignment (except Prob. 1)
   Submission in formal report format
   All problems will be “graded” and discussed
   Redesign problem after spring break
Problem Grading Process –
  Students submits formal solution
  Instructor solution presented in class session
  Students self grade own problem submission
  Self assigned grades submitted and recorded
  Some selected solutions reviewed by instructor weekly
  Each student will have one solution instructor graded
  Grading guidelines and metrics will be provided