COURSE INFORMATION

Course Title	**Machine Design 1**
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Office Location	Mechanical Engineering Department, Semnan University, Semnan, Iran
Duration	16-week period
Grading Policy	Midterm Exam: 35%, Final Exam: 48.75%, Homework: 10% Project: 6.25%
Textbook(s)	Richard G. Budynas, J. Keith Nisbett, **Shigley's Mechanical Engineering Design**, 10th Edition, 2010

COURSE OUTLINE

Topic	**Week**
Introduction Design Process: Phases and Interactions Design Considerations Standards and Codes Stress and Strength Factor of Safety Hardness	**1**
Load and Stress Analysis Normal and Shear Stresses Stresses due to Axial, Bending, Torsional, Transverse Shearing Loads Combined Stresses Principal Stresses and Strains Stress Transformation via Mohr's Circle and Transformation Matrices	**2**
Stress Concentration Pressurized Cylinders Rotating Disks Press and Shrink Fits	**3**
Static Failures Static Failure Criteria Maximum-Shear-Stress (MSS/Tresca) Criterion for Ductile Materials Distortion-Energy (DE/Von-Mises) Criterion for Ductile Materials Maximum-Octahedral-Shear-Stress Criterion for Ductile Materials	**4**
Ductile-Coulomb-Mohr (DCM) Criterion for Ductile Materials Maximum-Normal-Stress (MNS) Criterion for Brittle Materials Brittle-Coulomb-Mohr (BCM) Criterion for Brittle Materials Modified-Coulomb-Mohr (MCM) Criterion for Brittle Materials Stress Concentration Factors: Normal and Shear Types Static Design of Notched Components	**5**
Fatigue Failures Introduction to Fatigue in Metals: Stages of Fatigue Failure Fatigue Life Prediction Approaches Fracture Mechanics-Based Method for Cracked Bodies Strain-Based Methods for Un-cracked Bodies	**6**
Stress-Based Methods for Un-cracked Bodies LCF and HCF Damages Fatigue Strength and S-N Diagram The Endurance Limit	**7**
Endurance Limit Modifying Factors Fatigue Stress Concentration and Notch Sensitivity Characterizing Fluctuating Stresses	**8**

Fatigue Failure Criteria for Fluctuating Stress Soderberg Criterion Modified Goodman Criterion Gerber Criterion ASME-elliptic Criterion Langer Static Yield Line	**9**
Torsional Fatigue Strength under Fluctuating Stresses Combinations of Fatigue Loading Modes Cumulative Fatigue Damage	**10**
Design of Mechanical Elements **Shaft Design** Power/Torque Transmission: Direct & Indirect Shaft-Hub Connections Key/Key-way Design Fits and Tolerances for Key/Key-way and Shaft-Hub Connections	**11**
Shaft Design for Stress Design for Static Loading Westinghouse Code Formula DE-Goodman Code Formula DE-Soderberg Code Formula MSS-Goodman Code Formula MSS-Soderberg Code Formula Shaft layout	**12**
Screws and Fasteners/Nonpermanent Joints Thread Standards and Definitions Power Screws Fastener Stiffness Member Stiffness Bolt Strength	**13**
Tension Joints Relating Bolt Torque to Bolt Tension Statically Loaded Tension Joint with Preload Gasketed Joints/Sealing Fatigue Loading of Tension Joints Bolted and Riveted Joints Loaded in Shear	**14**
Welding and Bonding/Permanent Joints Welding Symbols Butt and Fillet Welds Stresses in Welded Joints in Torsion Stresses in Welded Joints in Bending The Strength of Welded Joints Welded Joints under Static Loading Welded Joints under Fatigue Loading	**15**
Mechanical Springs Stresses in Helical Springs The Curvature Effect Deflection of Helical Springs Compression Springs Stability Spring Materials Helical Compression Spring/Design for Static Service Helical Compression Spring Design for Fatigue Loading	**16**