Solid Mechanics   Syllabus

●Instructor: Professor Youn, Byeng Dong
●Introduction: This course is concerned with the mechanics of rigid and deformable solids in equilibrium. The course contents include statics, analysis of deformable bodies, forces and moments, stress-strain-temperature relation, torsion, stress and displacement due to bending, and energy methods

●Textbook: Stephen H. Crandall, Norman C. Dahl, Thomas J. Lardner
         -**An Introduction to the Mechanics of Solids**, 2nd ed. McGraw-Hill, 1978

●Reference Textbooks:
    (1) Irving H. Shames
        -Introduction to solid mechanics, 3rd ed. Prentice Hall International, Inc. 2000
    (2) James M. Gere
        -Mechanics of Materials, 6th ed. Pacific Grove, 2004

●Lecture Schedule:
Wk1   Chapter 1   Statics: Elements of Equilibrium
    (1.1-1.8) -Review of Forces and Moments, Vectors, Equilibrium, Free-body Diagram, Force-Deformation, 1-D Force-Deformation Relationships; Truss Structures, Statically Determinate and Indeterminate Situations
Wk2   Chapter 2   Mechanics of Deformable Bodies: Introduction
    (2.1-2.3) -Analysis of Deformable Bodies, Uniaxial Loading & Deformation, Statically Determinate Situation
    (2.4,2.6) -Statically Indeterminate Situation, Elastic Energy; Castigliano's Theorem
Wk3   Chapter 3   Forces and Moments Transmitted by Slender Members
    (3.1-3.4) -General Method, Distributed Load, Resultant of Distributed Load
    (3.5-3.7) -Differential Equilibrium Relationship, Singularity Function, Fluid Force
Wk4   Chapter 4   Stress & Strain
    (4.1-4.4) -Stress, Plane Stress, Equilibrium of a Differential Element in Plane Stress
    (4.5-4.7) -Stress Components Associated with Arbitrarily Oriented Faces in Plane Stress, Mohr's Circle Representation of Plane Stress, Mohr's Circle Representation of General State of Stress

Wk5   Chapter 4   Stress & Strain
    (4.8-4.12) -Analysis of Deformation, Definition of Strain Component, Relation between Strain & Displacement in Plane Strain, Mohr's Circle Representation of Plane Strain
Wk6   Chapter 5   Stress-Strain-Temperature Relations
    (5.1-5.3) -Tensile Test, Idealization of Stress-Strain Curve
Wk7   Chapter 5   Stress-Strain-Temperature Relations
    (5.4-5.6) -Elastic Stress-Strain Relations, Thermal Strain, Complete Equations of Elasticity
    (5.7)   -Complete Elastic Solution for a Thick-Walled Cylinder
Wk8   Chapter 5   Stress-Strain-Temperature Relations
    (5.8-5.9)   -Strain Energy in an Elastic Body, Stress Concentration
    (5.11-5.12) -Criteria for Initial Yielding, Behavior Beyond Initial Yielding in the Tensile Test
Wk9   Chapter 6   Torsion
    (6.1-6.5) -Geometry of Deformation of a Twisted Circular Shaft, Stresses Obtained from Stress-Strain Relation, Equilibrium Requirement, Stress & Deformation in a Twisted Elastic Circular Shaft
Wk10   Chapter 6   Torsion
    (6.6-6.8) -Torsion of Elastic Hollow Circular Shafts, Stress Analysis in Torsion; Combine

Stress, Strain Energy due to Torsion

(6.9-6.11) -Onset of Yielding in Torsion, Plastic Deformation, Residual Stresses

Wk11 Chapter 7   Stresses due to Bending

(7.1-7.3) -Geometry of Deformation of a Symmetrical Beam Subjected to Pure Bending, Stress Obtained from Stress-Strain Relation, Equilibrium Requirement

(7.4) -Strain Energy due to Bending, Onset of Yielding in Bending, Plastic Deformation

Wk12 Chapter 7   Stresses due to Bending

(7.5) -Stress & Deformation in Symmetrical Elastic Beam Subjected to Pure Bending

(7.6) -Stress in Symmetrical Elastic Beam Transmitting both Shear Force & Bending Moment

Wk13 Chapter 7   Stresses due to Bending

(7.8)   - Strain Energy due to Bending

Wk14 Chapter 7   Stresses due to Bending

(7.9, 7.10) -Onset of Yielding in Bending, Plastic Deformation

Chapter 8   Deformation due to Bending

(8.1-8.3)   -Moment − Curvature Relation, Integration of the Moment-Curvature Relation

Wk15 Chapter 8   Deformation due to Bending

(8.4-8.5) -Superposition, Load − Deflection Differential Equation