Syllabus

Mechanics and Design M2794.001400

Instructor: Professor Youn, Byeng Dong (bdyoun@snu.ac.kr) (Building 301, #1514) TA: Kim, Sooho <ksho1204@snu.ac.kr> 883-1664 (Building 313, #324-2) Nah, Kyumin <<u>jeonryu@naver.com</u>> 880-1664 (Building 313, #324-2) Park, Jongmin <20jmp02@naver.com> 880-1664 (Building 301, #215)

TA office hour: Friday, 4~6 p.m.

This course offers the concepts and general principles to solid mechanics, designed to appeal to the intuition and understanding of advanced undergraduate students in engineering. The course begins with the contents including a preliminary of vector and tensor, constitutive relations of stress and strain, structural stability (or buckling) analysis, and energy methods in the beginning. Later, fundamentals of finite element method (FEA) will be discussed with truss, beam, and plane stress/strain elements, and followed by a standard iso-parametric formulation of the FEA. The course highlights discussion of yielding behavior in multi-dimension, plastic deformation, and stress-strain relation of anisotropic materials. Basics of fracture and fatigue failures will wrap up the course.

Textbook: Stephen H. Crandall, Norman C. Dahl and Thomas J. Lardner – An Introduction to the Mechanics of Solids, 3rd Edition, McGraw-Hill, 2012

Reference:

(1) Y.C. Fung, Foundations of solid mechanics, Prentice-Hall, 1965

(2) Robert D. Cook, Davis S. Malkus, Michael E. Plesha, Concepts and applications of finite element analysis, 3rd Edition, Wiley, 1989

(3) Lanrence E. Malvern, Introduction to the Mechanics of a continuous Medium, Prentice-Hall, 1969

Course schedule:

Week 1 Vector and Tensor Preliminary, Stress Transformation Week 2 Three-Dimensional Strain Relation and Constitutive Relations Week 3 Energy Methods - Work and Energy, Strain Energy Week 4 Energy Methods - Castigliano's Theorem, Dynamic Loading Week 5 Stability of Equilibrium: Buckling of Columns <Mid-term Exam I - 10/2> - in class Week 6 Fundamentals of FEA: Introduction, Truss Element Week 7 Fundamentals of FEA: Beam Element Week 8 Fundamentals of FEA: Plane Stress and Plane Strain Element Week 9 Fundamentals of FEA: Iso-parametric Formulation Week 10 Stress-Strain Relations: Plastic and Anisotropic Behavior <Mid-term Exam II - 11/1> - in class Week 11 Stress-Strain Relations: Plastic and Anisotropic Behavior Week 12 Fundamentals of Fracture Mechanics Week 13 Introduction of Fatigue Fracture Week 14 Introduction of Fatigue Fracture

Week 15 Introduction of Fatigue Fracture and Semester Review

<Final Exam - 12/11> - in class

Evaluation: Three exams (Mid-term I 20%, Mid-term II 20% and Final 20%), Homework (20%), One project (20%), Four Pop-up quizzes (10%), Attendance (10%). (Total 120%)

Consideration:

Homework assignments will be provided <u>in every class</u> and they should be submitted by the due date <u>in class</u>. For fairness on grading assignments, late submission is not allowed.

All information related to the course will be given at eTL(http://etl.snu.ac.kr/).