

PLASTICITY AND DAMAGE MECHANICS

Instructors: Prof. Antonios Giannakopoulos

agiannak@uth.gr

Class: Fridays 15:00-18:00

Office Hours:

Textbook:

J. Lubliner, 2008. Plasticity Theory. Dover Macmillan Publishing Company, New York (1990), Pearson Education, Inc.

Recommended Reading:

P. Chadwick, 1999. Continuum Mechanics. Concise Theory and Problems. 2nd edition, Dover Publications. Mineola, New York

A UNIFORM APPROACH TO ELASTO-PLASTIC ANALYSIS OF ROTARY DEFORMATION BASED ON THE USE OF HYPERELASTIC CONSTITUENT EQUATIONS by J.C. SIMO. M. ORTIZ

Jean Lemaitre A Lesson in Mechanical Damage

CONTENTS

A. Plasticity of Materials

A.1 Introduction

A.2 Limit analysis - reminders

A.3 Absolutely solid-perfect plastic body

A.4 Elastoplastic analysis

A.5 Rate effects

A.6 Special issues

A.7 Thermodynamics

A.9 Large plastic deformation and rotation

A.8 Cyclic plasticity and low cycle fatigue

B. Breakage of Materials

B.1 Small and large cracks

B.2 Crack analysis with linear elasticity

B.3 Analysis of cracks with nonlinear elasticity and plasticity

B.4 Diffuse micro-cracking and damage parameter

Topics:

Reminders from Continuum Mechanics

Principle of possible projects

Conservation of energy

Rates of change of strains and stresses

Constitutive theories

Thermoelasticity

Incompressibility

Yield condition/ Flow law/ yield surface consequence

Thermomechanical state/ internal parameters/ free energy density

Tangential stiffness
Plastic diffusion/ 2nd Thermodynamic law
Small elastoplastic deformations
Uniqueness of solution
Thermodynamics of microfracturing
Constitutive laws of microfracturing
Internal parameters of microcracking