

441. APPLIED MATHEMATICS FOR MECHANICAL ENGINEERS

CONTENTS

1 Semester (3h+2h)

Tensor analysis and continuum-mechanical theory.

Algebra of euclidean tensors. Definitions. Tensor as multilinear map. Group property. Algebraic operations. Curvilinear coordinates. Tensor fields. Covariant differentiation. Particular cases.

Mechanics of continua. Kinematics. Material derivative. Analysis of deformation. Stress tensor. Conservation laws. Constitutive equations. Perfect fluids. Elastic materials. Viscosity in fluids. Plasticity. Detonation theory. Chemical reaction equations.

Continuum mechanics numerical simulation as a general purpose task.

Method of finite elements: Several formulations. Bare notions about consistency and stability. Overview of some techniques in the method of finite elements.

Continuum mechanics numerical simulation codes: Some features. Discretization: Hourglass and artificial viscosities. Time update.

TEXT (BASIC BIBLIOGRAPHY)

"Cálculo tensorial y mecánica del continuo". E. Garbayo. Sección de publicaciones de la E.T.S.I. Industriales de Madrid. 1992.

"Análisis tensorial". I.S. Sokolnikoff. Editorial Index. 1979.

"Theoretical manual for DYNA3D". J.O. Hallquist. Lawrence Livermore Laboratory. 1983.

Professors: E. Garbayo, J.M. Pesquero.

Exams:

F1: F2: F3: F4: F5: