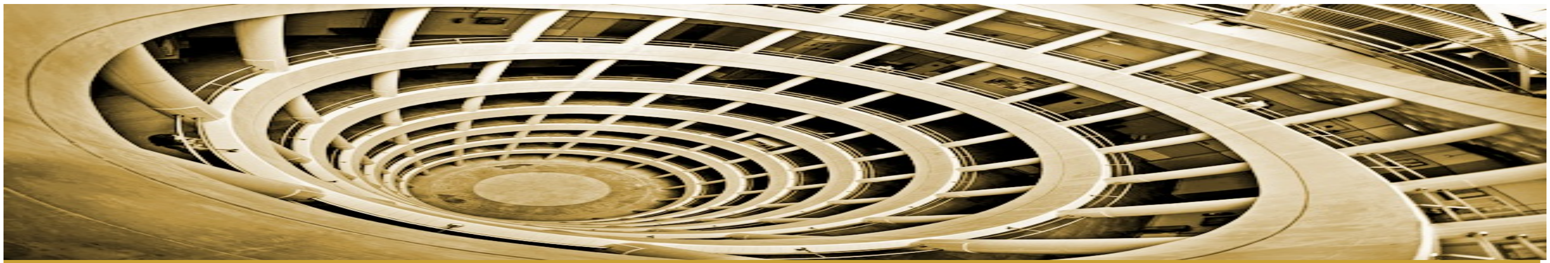
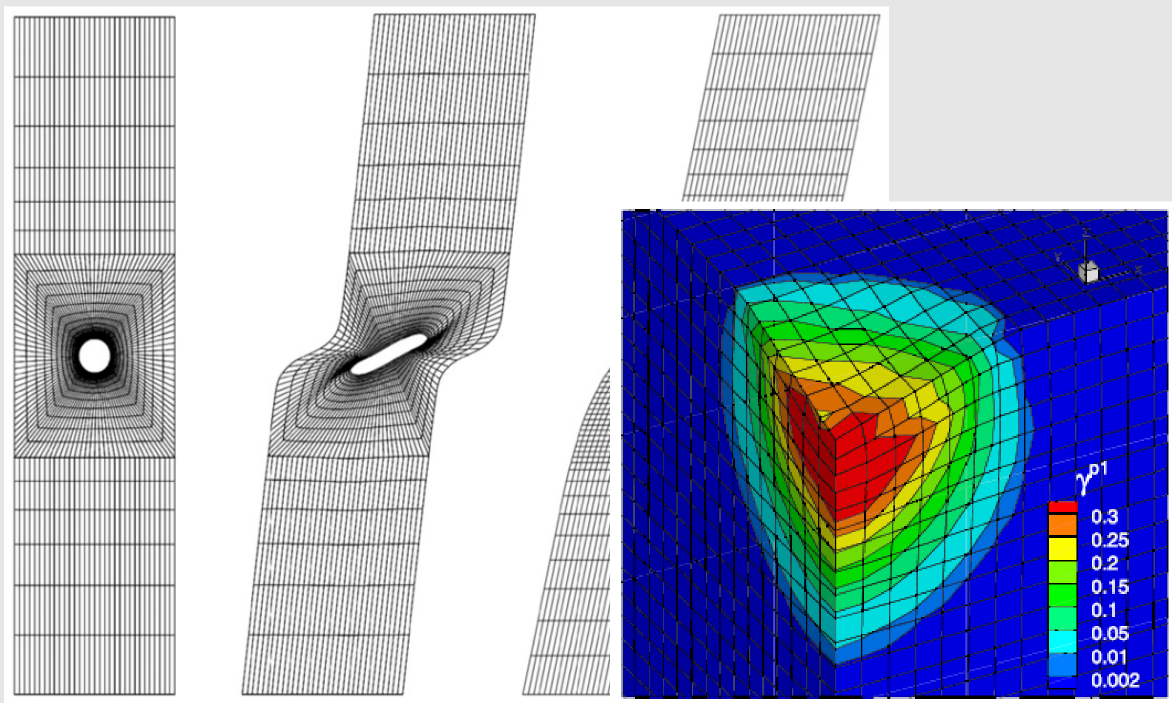


SEMINARIO JOSÉ ANTONIO GARCÍA GARCÍA

MÁSTER DE ESTRUCTURAS

DUCTILE FAILURE AT INTERMEDIATE, HIGH OR LOW STRESS TRIAXIALITY



Viggo TVERGAARD

Department of Mechanical Engineering, Solid Mechanics

Technical University of Denmark

Día: 17 **de octubre** 2011 a las **12:00h**

Lugar: **Seminario I, 4ª planta de**

E.T.S. Ingeniería de Caminos, C y P, Campus Fuentenueva

Universidad de Granada

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Constitutive models for porous ductile materials, like the Gurson model, are primarily developed to describe ductile fracture or crack growth. Examples of such applications will be briefly mentioned, including some full 3D numerical studies, the incorporation of such failure models in a special cohesive zone element, or applications to powder compaction. Also analyses of crack growth through a discretely represented pattern of holes will be demonstrated.

At high stress triaxialities the porous ductile material models also work well. But, in the case of very small void volume fractions the phenomenon of cavitation instabilities can occur. In practice this mechanism is important when plastic flow occurs under highly constrained conditions, such as in metal-ceramic systems, but the instability does not occur at the tip of a blunting crack in a homogeneous metal. The discussion will include effects of strain gradient plasticity in the metal surrounding the cavity.

When voids are present in a ductile material subject to a shear dominated stress state under low stress triaxiality the voids collapse to micro-cracks, and these cracks subsequently rotate and elongate in the shear field. Gurson type constitutive models are not able to describe such ductile fracture in simple shear, in the absence of hydrostatic tension in the material. However, recent micro-mechanical studies have demonstrated how the voids are flattened out to micro-cracks, which coalescence with neighbouring micro-cracks due to their continued rotation and elongation, so that the failure mechanism in shear is very different from that under tensile loading. Several micro-mechanical studies of the behavior of voids in shear will be presented, including some comparison with numerical studies carried out by using a new shear-extended Gurson model.