## Contents

Foreword
List of most frequently used symbols
Instability of homogeneous plastic strain and localized necking of thin sheets and shear band growth in three-dimensional bodies. Basic considerations for incompressible materials with pressure independent yield surface  14
1.1. Relation between strain localization and fracture initiation       14         1.2. Localized necking as a two-dimensional problem       15         1.3. Stability and instability of homogeneous strain in three-dimensional bodies       18         1.4. Strain localization in bands       20
2. Three-dimensional constitutive equations of incompressible materials
Classic constitutive equations based on plastic flow theory, with isotropic expansion of yield surface      Constitutive equations of deformation theory as a model of polycrystalline materials behaviour at small deviations from the proportional loading      Constitutive equations with more complex properties under generally non-proportional loading
3. Constitutive equations of void-containing materials based on the plastic flow theory
3.1. Yield surface and deduction of the differential form of constitutive equations 2.3. Determination of material parameters in Gurson-Tvergaard equations 3.3. Nucleation of voids 3.4. Constitutive equations of void-containing polycrystalline materials 3.4.
4.1. Physical mechanisms promoting strain localization
5. Localized necking of thin sheets of incompressible materials for different strain
geometries 40
5.1. Isotropic material       40         5.2. Anisotropy – simple model with quadratic yield surface       42         5.3. Non-conventional yield surface models       47         5.4. Influence of inhomogeneities on localized necking of thin sheets       50
6. Shear band formation in three-dimensional bodies for different strain geometries 52
6.1. Materials with volume dilatation 52. 6.2. Incompressible materials with pressure independent yield surface 55.
7. Influence of inhomogeneities of different types on shear band initiation at plane
deformation of incompressible material
7.1. Inhomogeneities in a form of bands

7.5. Otherar condusions valid for commenced Beamerica or missing Services	71 73
	73
8. Applications – comparison of theory and experiments	
8.1. Interpretation of morphology of ductile fracture and of sequence of processes leading	
	73
8.3. Prediction of ductile fracture of polycrystalline materials in form	74
of three dimensional codies	76
6.5.1. Incompression materials with pressure mappingent field carries	76
0.5.2. York Containing materials	79
9. Correlation of constitutive properties and fracture toughness and simulation	
of crack growth resistance curves	88
7.1. Time par knowledge obtained from eared actions of the finite element member 11.1.	88
9.2. Simple correlations of conventional characteristics of tensile properties and fracture	0.0
9.3. Constitutive equations involving gradient of strain and characteristic size	90
	92
9.4. Correlation of constitutive properties and fracture toughness based on analysis	
of strain localization in canas	96
9.5. Simulation of crack growth resistance curves based on both constitutive properties and local fracture criteria	00
and rocal macture emona	05
10. Conclusions and perspectives	05
10.1. Constituti o equations accompanies	UJ
10.2. Bifurcation analysis for homogeneous strain rate insensitive materials and ductile fracture prediction	05
10.3. Inhomogeneities and strain rate sensitivity of stress in relation to the ductile fracture	.05
	06
	06
	08
	12
	15