

---

# Contents

<b>1</b>	<b>Damage Mechanics . . . . .</b>	<b>1</b>
1.1	Review of Continuum Damage Mechanics . . . . .	2
1.2	Decomposition of the Damage Variable in One Dimension . . . .	3
1.3	General Decomposition of the Damage Variable in Three Dimensions . . . . .	7
1.4	Damage of Fiber-Reinforced Composite Materials with Micromechanical Characterization . . . . .	11
1.4.1	Definitions and Assumptions . . . . .	13
1.4.2	Composite Analysis . . . . .	14
1.4.3	Damage Analysis. . . . .	16
1.4.4	Constitutive Equations . . . . .	19
1.4.5	Evolution of Damage . . . . .	22
1.4.6	Example 1 – Uniaxial Tension of a Unidirectional Lamina . . . .	24
1.4.7	Example 2 – A Unidirectional Lamina Under Plane Stress . . . .	27
	Exercises . . . . .	34
<b>2</b>	<b>Finite Element Damage Analysis of Plate Bending . . . . .</b>	<b>37</b>
2.1	Introduction . . . . .	37
2.2	Ductile Plastic Damage in Plate Bending Problems. . . . .	39
2.2.1	Ductile Plastic Damage of Beams . . . . .	39
2.2.2	Ductile Plastic Damage of Plate Bending. . . . .	42
2.3	A Damage Node Model for Ductile Plastic Damage of Plate Bending . . . . .	45
	Exercises . . . . .	50
<b>3</b>	<b>Using DNA . . . . .</b>	<b>53</b>
3.1	Installing DNA . . . . .	55
3.2	Running DNA . . . . .	56
3.3	Installing Ghostscript and GSView . . . . .	58
3.4	Viewing the Finite Element Mesh and Contours . . . . .	58
3.5	Installing the DNA Windows Interface . . . . .	70

---

3.6	Using the DNA Windows Interface. . . . .	71
3.7	Example 1 – Plane Strain Problem in Plasticity . . . . .	74
3.8	Example 2 – Elastic Cantilever with Two Elements . . . . .	74
3.9	Example 3 – Center-Cracked Plate Under Uniaxial Tension . . . . .	76
3.10	Compiling and Building the DNA Executables. . . . .	76
	Exercises . . . . .	81
<b>4</b>	<b>DNA Commands . . . . .</b>	<b>83</b>
4.1	Command Reference. . . . .	83
4.2	Library of Finite Elements in DNA . . . . .	96
<b>5</b>	<b>The Tensor Library . . . . .</b>	<b>99</b>
5.1	Introduction . . . . .	99
5.2	Fortran Source Code. . . . .	101
	<b>References . . . . .</b>	<b>103</b>
	<b>Contents of the Accompanying CD-ROM . . . . .</b>	<b>109</b>
	<b>Subject Index . . . . .</b>	<b>111</b>

<http://www.springer.com/978-3-540-42279-2>

Damage Mechanics with Finite Elements  
Practical Applications with Computer Tools  
Kattan, P.I.; Voyiadjis, G.Z.  
2002, X, 113 p., Hardcover  
ISBN: 978-3-540-42279-2