

## <<中级材料力学>>

### 图书基本信息

书名 : <<中级材料力学>>

13位ISBN编号 : 9787302062646

10位ISBN编号 : 7302062641

出版时间 : 2003-1

出版时间 : 清华大学出版社

作者 : 巴勃

页数 : 594

版权说明 : 本站所提供之下载的PDF图书仅提供预览和简介,请支持正版图书。

更多资源请访问 : <http://www.tushu007.com>

## <<中级材料力学>>

### 内容概要

《中级材料力学》是为理工科大学生和工程设计人员编写的材料力学、材料强度和应力分析教材，覆盖了该领域二级教程所需要的基本内容。

书中通过许多日常生活和工程应用中的实际例子帮助读者建立关于力学概念的直观感性认识。告诉读者如何通过简单试验去验证理论概念，从而使他们能深入理解在工程设计公式中如何应用这些概念。

广泛收集了大量基本的和高难度的习题，并注意与工程实际和设计经验紧密联系。

《中级材料力学》积累了作者的教学经验，对一些通常认为枯燥而困难的问题给出了新颖而现代的处理方法。

《中级材料力学》是本面向工程设计的力学教材，对从事应力分析和强度设计的科技工作者、讲授高等材料力学和应力分析课程的教师以及理工院校的高年级学生和研究生是一本很好的参考书。

## &lt;&lt;中级材料力学&gt;&gt;

## 书籍目录

CONTENTS

Chapter 1 Introduction  
 1.1 The Engineering Design Process  
 1.1.1 Economics of design calculations  
 1.2 Design Optimization  
 1.2.1 Predicting the behavior of the component  
 1.2.2 Approximate solutions  
 1.3 Relative Magnitude of Different Effects  
 1.4 Formulating and Solving Problems  
 1.4.1 Use of procedures  
 1.4.2 Inverse problems  
 1.4.3 Physical uniqueness and existence arguments  
 1.5 Review of Elementary Mechanics of Materials  
 1.5.1 Definition of stress components  
 1.5.2 Transformation of stress components  
 1.5.3 Displacement and strain  
 1.5.4 Hooke's law  
 1.5.5 Bending of beams  
 1.5.6 Torsion of circular bars  
 1.6 Summary

Chapter 2 Material Behavior and Failure  
 2.1 Transformation of Stresses  
 2.1.1 Review of two-dimensional results  
 2.1.2 Principal stresses in three dimensions  
 2.2 Failure Theories for Isotropic Materials  
 2.2.1 The failure surface  
 2.2.2 The shape of the failure envelope  
 2.2.3 Ductile failure (yielding)  
 2.2.4 Brittle failure  
 2.3 Cyclic Loading and Fatigue  
 2.3.1 Experimental data  
 2.3.2 Statistics and the size effect  
 2.3.3 Factors influencing the design stress  
 2.3.4 Effect of a superposed mean stress  
 2.3.5 Summary of the design process  
 2.4 Summary

Chapter 3 Energy Methods  
 3.1 Work Done on Loading and Unloading  
 3.2 Strain Energy  
 3.3 Load-Displacement Relations  
 3.3.1 Beams with continuously varying bending moments  
 3.3.2 Axial loading and torsion  
 3.3.3 More general expressions for strain energy  
 3.3.4 Strain energy associated with shear forces in beams  
 3.4 Potential Energy  
 3.5 The Principle of Stationary Potential Energy  
 3.5.1 Potential energy due to an external force  
 3.5.2 Problems with several degrees of freedom  
 3.5.3 Nonlinear problems  
 3.6 The Rayleigh-Ritz Method  
 3.6.1 Improving the accuracy  
 3.6.2 Improving the back of the envelope approximation  
 3.7 Castigliano's First Theorem  
 3.8 Linear Elastic Systems  
 3.8.1 Strain energy  
 3.8.2 Bounds on the coefficients  
 3.8.3 Use of the reciprocal theorem  
 3.9 The Stiffness Matrix  
 3.9.1 Structures consisting of beams  
 3.9.2 Assembly of the stiffness matrix  
 3.10 Castigliano's Second Theorem  
 3.10.1 Use of the theorem  
 3.10.2 Dummy loads  
 3.10.3 Unit load method  
 3.10.4 Formal procedure for using Castigliano's second theorem  
 3.10.5 Indeterminate problems  
 3.10.6 Three-dimensional problems  
 3.11 Summary

Further Reading

Chapter 4 Unsymmetrical Bending  
 4.1 Stress Distribution in Bending  
 4.1.1 Bending about one axis  
 4.1.2 Generalized bending  
 4.1.3 Force resultants  
 4.1.4 Uncoupled problems  
 4.1.5 Coupled problems  
 4.2 Displacements of the Beam  
 4.3 Second Moments of Area  
 4.3.1 Finding the centroid  
 4.3.2 The parallel axis theorem  
 4.3.3 Thin-walled sections  
 4.4 Further Properties of Second Moments  
 4.4.1 Coordinate transformation  
 4.4.2 Mohr's circle of second moments  
 4.4.3 Solution of unsymmetrical bending problems in principal coordinates  
 4.4.4 Design estimates for the behavior of unsymmetrical sections  
 4.4.5 Errors due to misalignment  
 4.5 Summary

Further Reading

Chapter 5 Nonlinear and Elastic-Plastic Bending  
 5.1 Kinematics of Bending  
 5.2 Elastic-Plastic Constitutive Behavior  
 5.2.1 Unloading and reloading  
 5.2.2 Yield during reversed loading  
 5.2.3 Elastic-perfectly plastic material  
 5.3 Stress Fields in Nonlinear and Inelastic Bending  
 5.3.1 Force and moment resultants  
 5.4 Pure Bending about an Axis of Symmetry  
 5.4.1 Symmetric problems for elastic-perfectly plastic materials  
 5.4.2 Fully plastic moment and shape factor  
 5.5 Bending of a Symmetric Section about an Orthogonal Axis  
 5.5.1 The fully plastic case  
 5.5.2 Nonzero axial force  
 5.5.3 The partially plastic solution  
 5.6 Unsymmetrical Plastic Bending  
 5.7 Unloading, Springback and Residual Stress  
 5.7.1 Springback and residual curvature  
 5.7.2 Reloading and shakedown  
 5.8 Limit Analysis in the Design of Beams  
 5.8.1 Plastic hinges  
 5.8.2 Indeterminate Problems  
 5.9 Summary

Further Reading

Chapter 6 Shear and Torsion of Thin-Walled Beams  
 6.1 Derivation of the Shear Stress Formula  
 6.1.1 Choice of cut and direction of the shear stress  
 6.1.2 Location and magnitude of the maximum shear stress  
 6.1.3 Welds, rivets, and bolts  
 6.1.4 Curved sections  
 6.2 Shear Center  
 6.2.1 Finding the shear center  
 6.3 Unsymmetrical Sections  
 6.3.1 Shear stress for an unsymmetrical section  
 6.3.2 Determining the shear center  
 6.4 Closed Sections  
 6.4.1 Determination of the shear stress distribution  
 6.5 Pure Torsion of

## &lt;&lt;中级材料力学&gt;&gt;

Closed Thin-Walled Sections 305  
6.5.1 Torsional stiffness 306  
6.5.2 Design considerations in torsion 309  
6.6 Finding the Shear Center for a Closed Section 310  
6.6.1 Twist due to a shear force 312  
6.6.2 Multicell sections 315  
6.7 Torsion of Thin-Walled Open Sections 316  
6.7.1 Loading of an open section away from its shear center 319  
6.8 Summary 322  
Further Reading 323  
Problems 323  
Chapter 7 Beams on Elastic Foundations 339  
7.1 The Governing Equation 340  
7.1.1 Solution of the governing equation 341  
7.2 The Homogeneous Solution 342  
7.2.1 The semi-infinite beam 343  
7.3 Localized Nature of the Solution 347  
7.4 Concentrated Force on an Infinite Beam 349  
7.4.1 More general loading of the infinite beam 350  
7.5 The Particular Solution 351  
7.5.1 Uniform loading 352  
7.5.2 Discontinuous loads 354  
7.6 Finite Beams 356  
7.7 Short Beams 358  
7.8 Summary 361  
Further Reading 361  
Problems 362  
Chapter 8 Membrane Stresses in Axisymmetric Shells 369  
8.1 The Meridional Stress 370  
8.1.1 Choice of cut 373  
8.2 The Circumferential Stress 375  
8.2.1 The radii of curvature 377  
8.2.2 Sign conventions 379  
8.3 Self-Weight 381  
8.4 Relative Magnitudes of Different Loads 384  
8.5 Strains and Displacements 386  
8.5.1 Discontinuities 387  
8.6 Summary 389  
Further Reading 390  
Problems 390  
Chapter 9 Axisymmetric Bending of Cylindrical Shells 401  
9.1 Bending Stresses and Moments 401  
9.2 Deformation of the Shell 403  
9.3 Equilibrium of the Shell Element 405  
9.4 The Governing Equation 406  
9.4.1 Solution strategy 408  
9.5 Localized Loading of the Shell 411  
9.6 Shell Transition Regions 412  
9.6.1 The cylinder to cone transition 415  
9.6.2 Reinforcing rings 417  
9.7 Thermal Stresses 419  
9.8 The ASME Pressure Vessel Code 421  
9.9 Summary 421  
Further Reading 422  
Problems 422  
Chapter 10 Thick-Walled Cylinders and Disks 429  
10.1 Solution Method 429  
10.1.1 Stress components and the equilibrium condition 430  
10.1.2 Strain, displacement, and compatibility 431  
10.1.3 The elastic constitutive law 432  
10.2 The Thin Circular Disk 434  
10.3 Cylindrical Pressure Vessels 440  
10.4 Composite Cylinders, Limits and Fits 443  
10.4.1 Solution procedure 444  
10.4.2 Limits and fits 447  
10.5 Plastic Deformation of Disks and Cylinders 448  
10.5.1 First yield 449  
10.5.2 The fully plastic solution 450  
10.5.3 Elastic-plastic problems 452  
10.5.4 Other failure modes 455  
10.5.5 Unloading and residual stresses 456  
10.6 Summary 457  
Further Reading 458  
Problems 458  
Chapter 11 Curved Beams 467  
11.1 The Governing Equation 467  
11.1.1 Rectangular and circular cross sections 470  
11.1.2 The bending moment 471  
11.1.3 Composite cross sections 474  
11.1.4 Axial loading 474  
11.2 Radial Stresses 480  
11.3 Distortion of the Cross Section 482  
11.4 Range of Application of the Theory 484  
11.5 Summary 485  
Further Reading 485  
Problems 485  
Chapter 12 Elastic Stability 491  
12.1 Uniform Beam in Compression 492  
12.2 Effect of Initial Perturbations 497  
12.2.1 Eigenfunction expansions 500  
12.3 Effect of Lateral Load (Beam-Columns) 501  
12.4 Indeterminate Problems 505  
12.5 Suppressing Low-Order Modes 506  
12.6 Beams on Elastic Foundations 510  
12.6.1 Axisymmetric buckling of cylindrical shells 512  
12.6.2 Whirling of shafts 513  
12.7 Energy Methods 518  
12.7.1 Energy methods in beam problems 519  
12.7.2 The uniform beam in compression 520  
12.7.3 Inhomogeneous problems 523  
12.8 Quick Estimates for the Buckling Force 524  
12.9 Summary 526  
Further Reading 526  
Problems 527  
Appendix A The Finite Element Method 537  
A.1 Approximation 538  
A.1.1 The "best" approximation 538  
A.1.2 Choice of weight functions 539  
A.1.3 Discrete approximations 541  
A.2 Axial Loading 545  
A.2.1 The structural mechanics approach 545  
A.2.2 Assembly of the global stiffness matrix 547  
A.2.3 The nodal forces 548  
A.2.4 The Rayleigh-Ritz approach 549  
A.2.5 Direct evaluation of the matrix equation 554  
A.3 Solution of Differential Equations 556  
A.4 Finite Element Solutions for the Bending of Beams 558  
A.4.1 Nodal forces and moments 562  
A.5 Two- and Three-Dimensional Problems 565  
A.6 Computational Considerations 566  
A.6.1 Data storage considerations 568  
A.7 Use of the Finite Element Method in Design 568  
A.8 Summary 569  
Further Reading 570  
Problems 570  
Appendix B Properties of Areas 577  
Appendix C Stress Concentration Factors 581  
Appendix D Answers to Even-Numbered Problems 585

## <<中级材料力学>>

### 版权说明

本站所提供下载的PDF图书仅提供预览和简介，请支持正版图书。

更多资源请访问:<http://www.tushu007.com>