

---

# Contents

List of Tables	ix
Preface to the Sixth Edition	xi
Preface to the First Edition	xiii

## Part 1 Definitions

Chapter 1 Definitions	3
<i>References</i>	

## Part 2 Facts; Principles; Methods

Chapter 2 The Behavior of Bodies under Stress	19
<i>Methods of Loading. Elasticity; Proportionality of Stress and Strain. Factors Affecting Elastic Properties. Load-Deformation Relation for a Body. Plasticity. Creep and Rupture under Long-Time Loading. Criteria of Elastic Failure and of Rupture. Fatigue. Brittle Fracture. Stress Concentration. Effect of Form and Scale on Strength; Rupture Factor. Prestressing. Elastic Stability. References.</i>	
Chapter 3 Principles and Analytical Methods	43
<i>Equations of Motion and of Equilibrium. Principle of Superposition. Principle of Reciprocal Deflections. Method of Consistent Deformations (Strain Compatibility). Principles and Methods Involving Strain Energy. Dimensional Analysis. Remarks on the Use of Formulas. References.</i>	
Chapter 4 Experimental Methods	51
<i>Measurement of Strain. Photoelastic Analysis. Detection of Plastic Yielding. Analogies. References.</i>	

Chapter 5 Properties of a Plane Area	59
--------------------------------------	----

## Part 3 Formulas and Examples

### Chapter 6 Tension, Compression, Shear, and Combined Stress 75

*Bar under Axial Tension (or Compression); Common Case. Bar under Tension (or Compression); Special Cases. Composite Members. Trusses. Body under Pure Shear Stress. Cases of Direct Shear Loading. Combined Stress.*

### Chapter 7 Beams; Flexure of Straight Bars 93

*Straight Beams (Common Case) Elastically Stressed. Composite Beams and Bimetallic Strips. Three-Moment Equation. Rigid Frames. Beams on Elastic Foundations. Deformation due to the Elasticity of Fixed Supports. Beams under Simultaneous Axial and Transverse Loading. Beams of Variable Section. Slotted Beams. Beams of Relatively Great Depth. Beams of Relatively Great Width. Beams with Wide Flanges; Shear Lag. Beams with Very Thin Webs. Beams Not Loaded in Plane of Symmetry; Flexural Center. Straight Uniform Beams (Common Case); Ultimate Strength. Plastic, or Ultimate Strength, Design. References.*

### Chapter 8 Curved Beams 233

*Bending in the Plane of the Curve. Deflection of Curved Beams. Circular Rings and Arches. Elliptical Rings. Curved Beams Loaded Normal to Plane of Curvature. References.*

### Chapter 9 Torsion 345

*Straight Bars of Uniform Circular Section under Pure Torsion. Bars of Noncircular Uniform Section under Pure Torsion. Effect of End Constraint. Effect of Longitudinal Stresses. Ultimate Strength of Bars in Torsion. Torsion of Curved Bars; Helical Springs. References.*

### Chapter 10 Flat Plates 391

*Common Case. Bending of Uniform-Thickness Plates with Circular Boundaries. Circular-Plate Deflection due to Shear. Bimetallic Plates. Nonuniform Loading of Circular Plates. Circular Plates on Elastic Foundations. Circular Plates of Variable Thickness. Disk Springs. Narrow Ring under Distributed Torque about Its Axis. Bending of Uniform-Thickness Plates with Straight Boundaries. Effect of Large Deflection; Diaphragm Stresses. Plastic Analysis of Plates. Ultimate Strength. References.*

### Chapter 11 Columns and Other Compression Members 487

*Columns; Common Case. Local Buckling. Strength of Latticed Columns. Eccentric Loading; Initial Curvature. Columns under Combined Compression and Bending. Thin Plates with Stiffeners. Short Prisms under Eccentric Loading. References.*

**Chapter 12   Shells of Revolution; Pressure Vessels; Pipes** **515**

*Circumstances and General State of Stress. Thin Shells of Revolution under Distributed Loadings Producing Membrane Stresses Only. Thin Shells of Revolution under Concentrated or Discontinuous Loadings Producing Bending and Membrane Stresses. Thin Multielement Shells of Revolution. Thin Shells of Revolution under External Pressure. Thick Shells of Revolution. Pipe on Supports at Intervals. References.*

**Chapter 13   Bodies under Direct Bearing and Shear Stress** **647**

*Stress due to Pressure between Elastic Bodies. Rivets and Riveted Joints. Miscellaneous Cases. References.*

**Chapter 14   Elastic Stability** **667**

*General Considerations. Buckling of Bars. Buckling of Flat and Curved Plates. Buckling of Shells. References.*

**Chapter 15   Dynamic and Temperature Stresses** **701**

*Dynamic Loading; General Conditions. Body in a Known State of Motion. Impact and Sudden Loading. Impact and Sudden Loading; Approximate Formulas. Remarks on Stress due to Impact. Temperature Stresses. References.*

**Appendix** **727**

*Factors of Stress Concentration*

**Name Index**      **745**

**Subject Index**      **753**