## **Table of contents provided by Syndetics**

- Professor J. M. Coulson (p. xiii)
- **Preface to Sixth Edition** (p. xv)
- **Preface to Fifth Edition** (p. xvii)
- **Preface to Fourth Edition** (p. xix)
- **Preface to Third Edition** (p. xxi)
- Preface to Second Edition (p. xxiii)
- **Preface to First Edition** (p. xxv)
- Acknowledgements (p. xxvii)
- 1. Units and Dimensions (p. 1)
- **1.1 Introduction** (p. 1)
- 1.2 Systems of units (p. 2)
- **1.3 Conversion of units** (p. 9)
- 1.4 Dimensional analysis (p. 12)
- 1.5 Buckingham's [Pi] theorem (p. 15)
- 1.6 Redefinition of the length and mass dimensions (p. 20)
- **1.7 Further reading** (p. 22)
- **1.8 References** (p. 22)
- **1.9 Nomenclature** (p. 22)
- Part 1 Fluid Flow (p. 25)
- 2. Flow of Fluids -- Energy and Momentum Relationships (p. 27)
- **2.1 Introduction** (p. 27)
- 2.2 Internal energy (p. 27)
- **2.3 Types of fluid** (p. 30)
- **2.4 The fluid in motion** (p. 39)
- 2.5 Pressure-volume relationships (p. 48)
- 2.6 Rotational or vortex motion in a fluid (p. 50)
- 2.7 Further reading (p. 55)
- **2.8 References** (p. 56)
- **2.9 Nomenclature** (p. 56)
- 3. Flow of Liquids in Pipes and Open Channels (p. 58)
- **3.1 Introduction** (p. 58)
- **3.2 The nature of fluid flow** (p. 59)
- 3.3 Newtonian fluids (p. 62)
- **3.4 Non-Newtonian Fluids** (p. 103)
- **3.5 Further reading** (p. 138)
- **3.6 References** (p. 139)
- **3.7 Nomenclature** (p. 140)
- 4. Flow of Compressible Fluids (p. 143)
- **4.1 Introduction** (p. 143)
- **4.2 Flow of gas through a nozzle or orifice** (p. 143)
- **4.3 Velocity of propagation of a pressure wave** (p. 152)
- 4.4 Converging-diverging nozzles for gas flow (p. 154)
- **4.5 Flow in a pipe** (p. 158)
- **4.6 Shock waves** (p. 174)

- **4.7 Further reading** (p. 178)
- **4.8 References** (p. 179)
- **4.9 Nomenclature** (p. 179)
- 5. Flow of Multiphase Mixtures (p. 181)
- **5.1 Introduction** (p. 181)
- **5.2 Two-phase gas (vapour)-liquid flow** (p. 182)
- 5.3 Flow of solids-liquid mixtures (p. 195)
- **5.4 Flow of gas-solids mixtures** (p. 213)
- **5.5 Further reading** (p. 226)
- 5.6 References (p. 227)
- **5.7 Nomenclature** (p. 229)
- 6. Flow and Pressure Measurement (p. 232)
- **6.1 Introduction** (p. 232)
- **6.2 Fluid pressure** (p. 233)
- **6.3 Measurement of fluid flow** (p. 243)
- **6.4 Further reading** (p. 272)
- **6.5 References** (p. 272)
- **6.6 Nomenclature** (p. 272)
- **7. Liquid Mixing** (p. 274)
- 7.1 Introduction -- types of mixing (p. 274)
- 7.2 Mixing mechanisms (p. 277)
- 7.3 Scale-up of stirred vessels (p. 280)
- 7.4 Power consumption in stirred vessels (p. 282)
- 7.5 Flow patterns in stirred tanks (p. 294)
- 7.6 Rate and time for mixing (p. 298)
- **7.7 Mixing equipment** (p. 301)
- **7.8 Mixing in continuous systems** (p. 310)
- **7.9 Further reading** (p. 311)
- **7.10 References** (p. 311)
- **7.11 Nomenclature** (p. 312)
- 8. Pumping of Fluids (p. 314)
- **8.1 Introduction** (p. 314)
- 8.2 Pumping equipment for liquids (p. 315)
- 8.3 Pumping equipment for gases (p. 344)
- 8.4 The use of compressed air for pumping (p. 358)
- **8.5 Vacuum pumps** (p. 364)
- 8.6 Power requirements for pumping through pipelines (p. 367)
- **8.7 Further reading** (p. 376)
- **8.8 References** (p. 376)
- **8.9 Nomenclature** (p. 377)
- Part 2 Heat Transfer (p. 379)
- 9. Heat Transfer (p. 381)
- **9.1 Introduction** (p. 381)
- **9.2 Basic considerations** (p. 381)
- 9.3 Heat transfer by conduction (p. 387)
- 9.4 Heat transfer by convection (p. 414)

- 9.5 Heat transfer by radiation (p. 438)
- 9.6 Heat transfer in the condensation of vapours (p. 471)
- **9.7 Boiling liquids** (p. 482)
- 9.8 Heat transfer in reaction vessels (p. 496)
- 9.9 Shell and tube heat exchangers (p. 503)
- 9.10 Other forms of equipment (p. 540)
- 9.11 Thermal insulation (p. 555)
- **9.12 Further reading** (p. 561)
- 9.13 References (p. 562)
- 9.14 Nomenclature (p. 566)
- Part 3 Mass Transfer (p. 571)
- 10. Mass Transfer (p. 573)
- **10.1 Introduction** (p. 573)
- **10.5 Mass transfer across a phase boundary** (p. 599)
- 10.2 Diffusion in binary gas mixtures (p. 575)
- 10.3 Multicomponent gas-phase systems (p. 593)
- **10.4 Diffusion in liquids** (p. 596)
- **10.6 Mass transfer and chemical reaction** (p. 626)
- **10.7 Mass transfer and chemical reaction in a catalyst pellet** (p. 634)
- 10.8 Practical studies of mass transfer (p. 646)
- **10.9 Further reading** (p. 654)
- **10.10 References** (p. 655)
- **10.11 Nomenclature** (p. 656)
- Part 4 Momentum, Heat and Mass Transfer (p. 661)
- 11. The Boundary Layer (p. 663)
- **11.1 Introduction** (p. 663)
- **11.2 The momentum equation** (p. 668)
- 11.3 The streamline portion of the boundary layer (p. 670)
- 11.4 The turbulent boundary layer (p. 675)
- **11.5 Boundary layer theory applied to pipe flow** (p. 681)
- 11.6 The boundary layer for heat transfer (p. 685)
- 11.7 The boundary layer for mass transfer (p. 691)
- **11.8 Further reading** (p. 692)
- **11.9 References** (p. 692)
- **11.10 Nomenclature** (p. 692)
- 12. Momentum, Heat, and Mass Transfer (p. 694)
- **12.1 Introduction** (p. 694)
- 12.2 Transfer by molecular diffusion (p. 696)
- 12.3 Eddy transfer (p. 700)
- **12.4 Universal velocity profile** (p. 706)
- **12.5 Friction factor for a smooth pipe** (p. 713)
- 12.6 Effect of surface roughness on shear stress (p. 715)
- 12.7 Simultaneous momentum, heat and mass transfer (p. 717)
- **12.8 Reynolds analogy** (p. 720)
- **12.9 Further reading** (p. 735)
- **12.10 References** (p. 735)

- **12.11 Nomenclature** (p. 735)
- **13.3 Humidity data for the air-water system** (p. 746)
- 13. Humidification and Water Cooling (p. 738)
- **13.1 Introduction** (p. 738)
- **13.2 Humidification terms** (p. 739)
- 13.4 Determination of humidity (p. 756)
- 13.5 Humidification and dehumidification (p. 759)
- **13.6 Water cooling** (p. 762)
- **13.7 Systems other than air-water** (p. 779)
- **13.8 Further reading** (p. 785)
- **13.9 References** (p. 786)
- **13.10 Nomenclature** (p. 787)
- **Appendix** (p. 789)
- A1. Tables of physical properties (p. 790)
- **A2. Steam tables** (p. 806)
- A3. Mathematical tables (p. 815)
- Fold-out charts
- **Problems** (p. 825)
- **Index** (p. 869)