Contents

Preface

List of contributors

1 Mechanical engineering principles

Status of rigid bodies · Strength of materials · Dynamics of rigid bodies · Vibrations · Mechanics of fluids · Principles of thermodynamics · Heat transfer · References

2 Electrical and electronics principles

Basic electrical technology · Electrical machines · Analogue and digital electronics theory · Electrical safety · References · Further reading

3 Microprocessors, instrumentation and control

Summary of number systems · Microprocessors · Communication standards · Interfacing of computers to systems · Instrumentation · Classical control theory and practice · Microprocessor-based control · Programmable logic controllers · The *z*-transform · State variable techniques · References · Further reading

4 Computers and their application

Introduction · Types of computer · Generations of digital computers · Digital computer systems · Categories of computer systems · Central processor unit · Memory · Peripherals · Output devices · Terminals · Direct input · Disk storage · Digital and analogue input/output · Data communications · Computer networks · Data terminal equipment · Software · Database management · Language translators · Languages

5 Computer-integrated engineering systems

CAD/CAM: Computer-aided design and computer-aided manufacturing ·Industrial robotics and automation · Computer graphics systems · References · Further reading

6 Design standards

Standardization in design · Drawing and graphic communications · Fits, tolerances and limits · Fasteners · Ergonomic and anthropometric data · Total quality – a company culture · References

7 Materials, properties and selection

Engineering properties of materials · The principles underlying materials selection · Ferrous metals · Non-ferrous metals · Composites · Polymers · Elastomers · Engineering ceramics and glasses · Corrosion · Non-destructive testing · References · Further reading

8 Mechanics of solids

Stress and strain · Experimental techniques · Fracture mechanics · Creep of materials · Fatigue · References · Further reading

9 Tribology

Basic principles · Lubricants (oils and greases) · Bearing selection · Principles and design of hydrodynamic bearings · Lubrication of industrial gears · Rolling element bearings · Materials for unlubricated sliding · Wear and surface treatment · Fretting · Surface topography · References · Further reading

10 Power units and transmission

Power units · Power transmission · Further reading

11 Fuels and combustion

Introduction · General fuel types · Major property overview · Major fuel groupings · Combustion · Conclusions · References

12 Alternative energy sources

Introduction · Solar radiation · Passive solar design in the UK · Thermal power and other thermal applications · Photovoltaic energy conversion · Solar chemistry · Hydropower · Wind power · Geothermal energy · Tidal power · Wave power · Biomass and energy from wastes · Energy crops · References

13 Nuclear engineering

Introduction · Nuclear radiation and energy · Mechanical engineering aspects of nuclear power stations and associated plant · Other applications of nuclear radiation · Elements of health physics and shielding · Further reading

14 Offshore engineering

Historical review · Types of fixed and floating structures · Future development · Hydrodynamic loading · Structural strength and fatigue · Dynamics of floating systems · Design considerations and certification · References

15 Plant engineering

Compressors, fans and pumps · Seals and sealing · Boilers and waste-heat recovery · Heating, ventilation and air conditioning · Refrigeration · Energy management · Condition monitoring · Vibration isolation and limits · Acoustic noise · References

16 Manufacturing methods

Large-chip metal removal · Metal forming · Welding, soldering and brazing · Adhesives · Casting and foundry practice · References · Further reading

17 Engineering mathematics

Trigonometric functions and general formulae · Calculus · Series and transforms · Matrices and determinants · Differential equations · Statistics · Further reading

18 Health and safety

Health and safety in the European Community · Health and safety at work – law and administration in the USA · UK legislation and guidance · The Health and Safety at Work etc. Act 1974 · The Health and Safety Executive · Local Authorities · Enforcement Notices · Control of Substances Hazardous to Health Regulations 1988 · Asbestos · Control of lead at work · The Electricity at Work Regulations 1989 · The Noise at Work Regulations 1989 · Safety of machines · Personal protective equipment · Manual handling · Further reading

19 Units, symbols and constants

SI units · Conversion to existing imperial terms · Abbreviations · Physical and chemical constants · Further reading

Index