

PREFACE

Materials Science and Engineering, Fourth Edition, is designed for a first course in materials science and engineering for engineering students. Understanding that this might be a student's first exposure to materials science, the book presents essential topics in a clear, concise manner, without extraneous details to overwhelm newcomers. Industrial examples and photographs used throughout the book give students a look at the many ways material science and engineering are applied in the real world.


NEW FEATURES OF THE FOURTH EDITION

In addition to its already renowned student-friendly writing style and applications to industry, the fourth edition offers new features including a thorough coverage of modern materials science topics that prepare students for life outside the classroom. The new sections are:

- New reference to smart materials/devices, MEMs, and nanomaterials (1.1)
- New reference to superalloys and their biomedical applications (1.3)
- Added discussion of engineering plastics and applications in automobiles (1.3.2)
- Added discussion of engineering ceramics and applications (1.3.3)
- Added discussion of composite materials (1.3.4)
- New coverage of smart materials and nanomaterials (1.5)
- New section featuring a simplified case study in selection of materials for the frame and forks of a bicycle (1.6)
- New coverage of amorphous materials was added in Chapter 3
- Added references to long and short range order (SRO also known as amorphous materials) (3.1)
- Chapter 4 has been split into chapters 4 and 5 for the fourth edition so diffusion can be covered in a stand-alone chapter
- Coverage of microscopes added to the end of Chapter 4
- Added coverage of planar defects and twin boundaries (4.4.3)
- New section on volume defects (4.4.4)
- New section on experimental techniques for identification of microstructure and defects (4.5)
- Added coverage of fine-grained metals and the Hall–Petch equation in Chapter 6

- New case study in failure and coverage of recent advances in improving mechanical performance in Chapter 7
- Added coverage of failure and fracture of metals (7.1)
- New section on ductile-to-brittle transition temperature (7.1.4)
- New section on recent advances and future directions in improving the mechanical performance of metals (7.7)
- New coverage of cooling curves in Chapter 8
- Added coverage of intermediate compounds (8.11.1)
- Three new sections devoted to advanced alloys and their application in biomedical engineering have been added to Chapter 9
- New section devoted to biomedical applications of polymeric materials added to Chapter 10
- New section with coverage of bucky balls and carbon nanotubes (11.2.12)
- New section on ceramic coatings and surface engineering (11.9)
- New section on ceramics in biomedical applications (11.10)
- New section on nanotechnology and ceramics (11.11)
- New section on bone: a natural composite material (12.11)
- New section on hydrogen damage (13.5.11)
- New section on nanoelectronics (14.9)
- New appendix featuring extensive materials properties reference

Other New Features:

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- Learning objectives have been added to every chapter
 - Icons have been added to highlight the supplemental media resources
 - Many new chapter openers and interior photos are included

Retained Features:

- Over 1200 end-of-chapter problems and over 180 materials selection and design problems are offered
- Over 140 example problems
- Modern applications of materials
- A concise, readable style is used throughout; readers are given understandable explanations without excessive detail

Online Learning Center

Web support is provided for the book at the website. Visit this site for book and supplement information, errata, author information, and resources for further study or reference.

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