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## **Materials for electronics and optoelectronics**

### Capitolul 1. STRUCTURE OF SOLID MATERIALS

- 1.1 Introduction
- 1.2 Order in Materials
- 1.3 Metallic Crystal Structures
- 1.4 Fundamental Types of Lattices
- 1.5 Crystallographic Planes
- 1.6 Crystallographic Directions
- 1.7 Interplanar Spacings
- 1.8 Crystal Structures
- 1.9 Reciprocal Lattice
- 1.10 Solved Problems for Chapter 1
- 1.11 Problems Proposed for Chapter 1
- 1.12 References for Chapter 1 (in alphabetical order)

### Capitolul 2. DISTRIBUTION OF ELECTRONS IN A CRYSTAL

- 2.1 Fermi Energy and Fermi Surface
- 2.2 Density of States Function  $Z(E)$
- 2.3 Fermi-Dirac Distribution Function  $F(E)$
- 2.4 Occupancy of Electronic States (Electron Population Density)  $n(E)$  and Calculation of the Fermi Energy
- 2.5 Effective Mass of an Electron in a Solid
- 2.6 Position of the Fermi Energy and a More Accurate Calculation of  $E_f$

- 2.7 Solved Problems for Chapter 2
- 2.8 Problems Proposed for Chapter 2
- 2.9 References for Chapter 2 (in alphabetical order)

### Capitolul 3. CONDUCTIVE PROPERTIES OF MATERIALS

- 3.1 Conductivity and Ohm's Law
- 3.2 Conductivity in Metals, Insulators and Semiconductors
- 3.3 Conductivity in Metals - Classical Free Electron Theory
- 3.4 Conductivity in Metals and Nonmetals - Quantum Mechanical Theory
- 3.5 Electrical Resistivity of Metals and Alloys
- 3.6 Electron Mobilities and Carrier Densities in Metals and Nonmetals
- 3.7 Solved Problems for Chapter 3
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### Capitolul 4. DIELECTRIC MATERIALS

- 4.1 Dielectric Properties
- 4.2 Theory of Polarization in Dielectrics
- 4.3 Types of Polarization
- 4.4 Dielectric Constant and Its Dependence on Polarizability, Frequency and Temperature
- 4.5 Types of Dielectric Materials
- 4.6 Ferroelectricity
- 4.7 Piezoelectricity
- 4.8 Electrostriction. Pyroelectricity
- 4.9 Solved Problems for Chapter 4
- 4.10 Problems Proposed for Chapter 4
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## Capitolul 5. SEMICONDUCTOR MATERIALS

5.1 Intrinsic Semiconductors

5.2 Extrinsic Semiconductors

5.3 Variation of Conductivity, Carrier Concentration and Bandgap with Temperature in Semiconductor Materials

5.4 Effective Masses in Semiconductors

5.5 Fabrication Techniques of Semiconductor Devices

5.6 Solved Problems for Chapter 5

5.7 Problems Proposed for Chapter 5

5.8 References for Chapter 5 (in alphabetical order)

## Capitolul 6. MAGNETIC MATERIALS

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6.2 Basic Concepts

6.3 Diamagnetism

6.4 Paramagnetism.

6.5 Ferromagnetism

6.6 Antiferromagnetism and Ferrimagnetism

6.7 Influence of Temperature on the Magnetic Behaviour of Materials

6.8 Magnetic Domains and Hysteresis

6.9 Soft and Hard Magnetic Materials

6.10 Energy Losses in Magnetic Materials

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7.2 General Properties of Superconductor Materials

7.3 BCS Theory of Superconductors

7.4 Type I and Type II Superconductors

- 7.5 Josephson Superconducting Tunneling
- 7.6 High-Temperature Superconductors
- 7.7 Solved Problems for Chapter 7
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- 8.1 History and Classification of Organic Materials
- 8.2 Molecular Structures for the Main Types of Organic Materials
- 8.3 Physics of Organic Semiconductor Materials
- 8.4 Organic Transistors 3
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- 8.7 Organic Photovoltaic Cells
- 8.8 Solved Problems for Chapter 8
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- 8.10 References for Chapter 8 (in alphabetical order)