

**Doc
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MPHYS NOTES

Solid State Physics

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Based on a course by Prof. Mike Godfrey

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Chapter 1

Crystal Structure and Reciprocal Lattice

1.1 Revision of Crystal Structures

1.2 The Reciprocal Lattice and its Properties

1.3 Indexing of X-Ray Diffraction Data

1.4 The Structure Factor

1.5 Brioullin Zones

Chapter 2

Electronic Structure of Solids

- 2.1 Revision of the Free-Electron Model
- 2.2 Nearly-Free-Electron Model of Electronic Structure
- 2.3 Modifications to the Fermi Surface Near Zone Boundaries
- 2.4 The Tight-Binding Model
- 2.5 Stability of Crystal Structures in the Nearly-Free-Electron Model
- 2.6 Jones' Theory of Tetrahedral Semiconductors and Metal Alloys
- 2.7 Semiclassical Dynamics of Bloch Electrons
- 2.8 Cyclotron Motions as a Probe of Electronic Structure

Chapter 3

Magnetism

3.1 Diamagnetism

3.1.1 Langevin Diamagnetism

3.1.2 Quantum Mechanical Derivation

3.2 Origin of Magnetic Moments in Atoms and Ions

3.2.1 Exchange Interaction

3.3 Quantum Description of Paramagnetism

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3.5.1 Ground-State

3.5.2 Excitations, Phonons