



Department of General Science

College of Basic education

University of Salahaddin

Subject: Semiconductrior

Course Book second (Year 2)

Lecturer's name: Dr Abbas Hussein Rostam

Academic Year: 2023/2024

16. Course Reading List and References:

- 1- ▪ Key references:
- 2- introduction to solid state physics (Charles kittel)
- 3- Elementary solid state physics principle and application (M.A Omer)
- 4- Solid state physics
- 5- Electronic circuit analysis and design (Donald A-Neamens)

- 6- Semiconductor of devices fundamentals (Robert F.pierrel)
- 7- Principle of semiconductor Devices (B Van zeghloroeck)
- 1- Useful references:
- 2- Electronic circuit analysis and design (Donald A-Neamens)
- 3- Electronic Devices (Thomas L-Floyed)
- 4- Principle of semiconductor Devices (B Van zeghloroeck)
- Magazines and review (internet):
some web side in internet

17. The Topics:

Chapter one

(1st , 2nd 3rd) Weeks

introduction :review on semiconductor historical and development industrial

1-1 Classification of solid by electrical conduction

1-2 Types of material

1-3 (solid, Liquid, gas and plasma)

1-4 Types of solid state by electrical conduction

1-5 Properties of these four types

1-6 Bonds of materials

1-7 Primary bonds (covalent bond, ionic bond and metallic bomnd)

1-8 Secondary bond

1-9 Atomic hydrogen

1-10 Electron in atom

1-11-Radius , wavelength ,orbital velocity and energy of electron in atoms

1-12 Electronic shells and orbital

Chapter two

(4th , 5th and 6th) Weeks

2-1 Development of semiconductor field Semiconductor

2 -2 - Type of Semiconductors according to their structure

2-3 Formation of bands in solid

2-4- Band theory and Formation allowed and forbidden band

2-5 - Band theory and Formation allowed and forbidden band

2-6- Two Types of Current Carrier in Semiconductors

2-7 - Semiconductor energy bands at room temperature

2-8 - Temperature dependence of the energy bandgap

2-9 – resistivity verse temperature and conductivity

2-10 –Semiconductors and its properties

2—11- insulators and conductors with their properties

Chapter three

_ (7th , 8th and 9th) Weeks

3-1: Distribution function of Distribution of Carries among band energy

3-2: Pauli Exclusion Principle

3-3: Bose_Einstein distribution function

3-4: Fermi-Dirac distribution function

3-5: Fermions and boson

3-6: Fermi energy

3-7:The Fermi probability function versus energy for different temperatures

3-8 : Applications of Fermi Energy

3-9: Type of semiconductor

3-10: Equilibrium distribution of electrons and holes

3-11: Extrinsic Semiconductors (N-Type and P-Type semiconductors

3-12: Carrier transport phenomena

3-13: Carrier drift

3-14: Drift current density

3-15: Conductivity and resisti

3-16: Diffusion current densit

Chapter four

(10th , and 11th) Weeks

4 -1 OPTICAL PROPERTIES: ABSORPTION PROCESSES

4-2-The fundamental absorption process

4-3 The absorption process (*direct-gap semiconductors*

4-4 Direct and Indirect Semiconductors

4-5 -Exciton absorption

4-5 Free-carrier absorption

4-6 Absorption processes involving impurities

Chapter Five (12^h and 13 6^h) Weeks

5-1: Types of defects in solid state

5-2: Imperfections in crystal structures

5-3: There are some types of crystal defect

5-4: point defects

5-5: A Frenkel defect and Schottky defect

5-6: Line defect

5-7: surface defect

18. Practical Topics (If there is any)	
Semiconductor physics don't have practice	

Kurdistan Regional Government Iraq

Module : Semiconductor

Ministry of Higher Education & Scientific Research

Stage : second

**Salahaddin University –Erbil
College of Basic Education**

**Round: first
Time : 2 hours**

Department : General Science

Exams (2023-2024)

second semester

Q1 A - Compare between Fermions and Bosons (Answer only two branches). (6+6+6) Marks.

B- Compare between Direct and Indirect Semiconductors.

C- Prove that in the below fermi level all state full from electron at zero kelvin temperature.

Q2 A- Why insulator not arise current. (4+6+8) Marks

B – Explain Drift current density of hole in semiconductor

C- Briefly explain P type semiconductor.

Q3: Choose the correct answer(only six) . 12 Marks

- 1- One of these bond is formed by sharing between valance electrons
(A-ionic B Covalent C- metallic) bond).
- 2- The distance between the top of the valance band to the bottom of the conduction band is called
(A- Valance band B-Conduction band C- Energy gap).
- 3- One of these correct
(A – $\sigma_{Conductor} < \sigma_{Insulatro} < \sigma_{Semi}$) (B – $\sigma_{Conductor} < \sigma_{Semi} < \sigma_{insul}$)
(C – $\sigma_{Insul} < \sigma_{Semi} < \sigma_{Condut}$) .
- 4- If $N_C = N_V$ fermi potion
(A- Below mid gap B-Above mid gap C- at mid gap).
- 5- Donor impurity produce
(A= electron majority B- hole majority C- electron minority) carriers .
- 6- The fundamental absorption process takes place when photon energy ($h\nu$).
(A $h\nu = E_g$ B- $h\nu \geq E_g$ C- $h\nu < E_g$)
- 7- Materials have short range order is called
(A- Crystalline B- Lattice C- Amorphous).

Q4 A- Draw Native point defects

(6+6+6) Marks

. B- Explain each addition of energy create a change in state of matter.

C--Calculate the energy of electron when the orbital radius of electron in hydrogen atom is $33.92 A^0$.

Best wishes

Lecture\ Instructor : Dr Abbas H Rostam

Signature

Date: 4-5-2024

21. Peer review

پیداچوونہوی ھاوہل

This course book has to be reviewed and signed by a peer.

The peer approves the contents of your course book by writing few sentences in this section.

(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject). .