

Engineering Physics (2025)

Course code 25PY101

Unit 1: Metals and Semiconductors

Course Instructor:

Dr. Sreekar Guddeti

Assistant Professor in Physics

Department of Science and Humanities

Vignan's Foundation for Science, Technology and Research

October 16, 2025

Unit 1 Plan

- 1 Condensed matter
- 2 Metals
- 3 Classical free electron theory
- 4 Expression of electrical conductivity
- 5 Introduction to Semiconductors
- 6 Electrical conductivity of semiconductors
- 7 Hall effect
- 8 Concept of Panchabhuta

Unit 1 Plan

- 1 Condensed matter
- 2 Metals
- 3 Classical free electron theory
- 4 Expression of electrical conductivity
- 5 Introduction to Semiconductors
- 6 Electrical conductivity of semiconductors
- 7 Hall effect
- 8 Concept of Panchabhuta

Panchabhuta – Five elements

- Etymology is Pancha (Sanskrit for five) and bhuta (Sanskrit for elements)
- Fundamental idea in Indian philosophy, Ayurveda, Yoga, and traditional sciences. It explains the composition of the universe, including the human body and mind, in terms of five basic elements.
- The Panchabhuta are considered the building blocks of the cosmos. Everything in the universe (macrocosm) and in the human body (microcosm) is made of these five elements in varying proportions.

Panchabhuta

Bhuta	Translation	Associated Sense	Body part
Ākāśa	Space/Ether	Hearing (śabda)	Cavities (Mouth) Channels (Nostrils) Spaces (Thorax, Abdomen)
Vāyu	Air	Touch (sparśa)	
Agni/Tejas	Fire	Sight (rūpa)	digestion, vision body temperature intelligence
Āpa / Jala	Water	Taste (rasa)	blood, saliva, digestive juices plasma, reproductive fluids
Pṛthvī	Earth	Smell (gandha)	bones, teeth, flesh, muscles, skin, nails, hair

Table: 1. Ākāśa represents emptiness, vastness, and the medium that allows sound to travel. 2. Vāyu symbolizes movement, motion, and dynamism. 3. Agni represents transformation, heat, energy, and metabolism. 4. Jala symbolizes fluidity, cohesion, and life-sustaining properties. 5. Pṛthvī represents solidity, stability, and structure.

End of Unit 1