



| B. Tech. | 1 | Semester | 1 / 2 | Teaching Scheme | | | | Evaluation Scheme | |
|-----------------------|--|----------|-------|---|---|---|---------|-------------------|-----|
| Subject Name | Semiconductor Physics Lab | | | L | T | P | Credits | CCE | SEE |
| Subject Code | BTAS21104 | | | 0 | 0 | 2 | 1 | 25 | 25 |
| Type of course | BSC: Basic Science Course | | | CCE: Continuous and Comprehensive Evaluation SEE : Semester End Evaluation | | | | | |
| Prerequisite | Basic understanding of Maths, Physics and Chemistry | | | | | | | | |
| Rationale | The basic science - physics course is to prepare students for careers in engineering program where physics principles can be applied to the advancement of technology. This education at the intersection of engineering and physics will enable students to seek employment in engineering upon graduation while, at the same time, provide a firm foundation for the pursuit of graduate studies in engineering. | | | | | | | | |

| Course Outcomes (COs): At the end of the course, students will be able to | Marks % Weightage |
|--|----------------------|
| CO – 1 Recall and interpret core concepts of solid-state physics and semiconductors using band theory and carrier statistics | 27% |
| CO – 2 Explain the behaviour of charge carriers in semiconductors under various physical conditions. | 27 % |
| CO – 3 Apply semiconductor principles to analyse junction behaviour, carrier transport, and basic device characteristics. | 20 % |
| CO – 4 Demonstrate awareness of how semiconductor devices contribute to technological solutions and sustainable systems. | 27 % |

| List of Laboratory Practical | | CO |
|------------------------------|---|------|
| 1 | Determination of Energy Band Gap of a semiconductor | CO-1 |
| 2 | Temperature Dependence of Semiconductor Conductivity using a semiconductor sample. | CO-2 |
| 3 | Measurement of charge carrier concentration, mobility, and type of charge carriers using the Hall Effect setup. | CO-4 |
| 4 | Measurement of resistivity of a semiconductor sample using the Four-Probe setup. | CO-4 |
| 5 | Verification of the Law of Mass Action in intrinsic and extrinsic semiconductors. | CO-2 |
| 6 | I-V Characteristics of a p-n Junction Diode | CO-3 |



| | | |
|----|---|------|
| 7 | I-V Characteristics of a Zener Diode: | CO-3 |
| 8 | Study of Light Emitting Diode (LED) Characteristics and measurement of its emission spectrum. | CO-2 |
| 9 | Solar Cell Efficiency Measurement: Determination of fill factor and conversion efficiency. | CO-4 |
| 10 | Luminous Intensity of a Laser Diode: Study of laser threshold conditions. | CO-4 |
| 11 | Study of Tunneling in a Tunnel Diode: Observation of negative resistance region. | CO-3 |
| 12 | Determine wavelength λ of a LASER | CO-4 |

Recommended Reference Books

- 1 D. A. Neamen, *Semiconductor Physics and Devices*, 4th ed. New York, NY, USA: McGraw-Hill Education, 2011. ISBN: 978-0073529585.
- 2 S. M. Sze and K. K. Ng, *Physics of Semiconductor Devices*, 3rd ed. Hoboken, NJ, USA: Wiley-Interscience, 2006. ISBN: 978-0471143239.
- 3 R. Enderlein and N. J. M. Horing, *Fundamentals of Semiconductor Physics and Devices*, 1st ed. Singapore: World Scientific Publishing, 1997. ISBN: 978-9810206381.
- 4 M. S. Tyagi, *Introduction to Semiconductor Materials and Devices*, 1st ed. New Delhi, India: Wiley India, 2008. ISBN: 978-8126517022.
- 5 K. Seeger, *Semiconductor Physics: An Introduction*, 9th ed. Berlin, Germany: Springer, 2004. ISBN: 978-3540254703.
- 6 B. G. Streetman and S. Banerjee, *Solid State Electronic Devices*, 7th ed. Noida, India: Pearson Education, 2015. ISBN: 978-0133356038.
- 7 P. Y. Yu and M. Cardona, *Fundamentals of Semiconductors: Physics and Materials Properties*, 4th ed. Berlin, Germany: Springer, 2010. ISBN: 978-3642007092.
- 8 M. Grundmann, *The Physics of Semiconductors*, 3rd ed. Cham, Switzerland: Springer, 2021. ISBN: 978-3030332564.
- 9 R. E. Hummel, *Electronic Properties of Materials*, 4th ed. New York, NY, USA: Springer, 2011. ISBN: 978-1441981639.
- 10 P. Bhattacharya, *Semiconductor Optoelectronic Devices*, 2nd ed. New Delhi, India: Pearson, 2017. ISBN: 978-9332535187.
- 11 G. S. Higginbotham, *Introduction to Semiconductor Physics and Devices*, 1st ed. Cham, Switzerland: Springer, 2022. ISBN: 978-3030778478.
- 12 A. Chen, *Advances in Semiconductor Technologies*, 1st ed. Hoboken, NJ, USA: Wiley-IEEE Press, 2023. ISBN: 978-1119869604.
- 13 A. Babichev and F. Furtmayr, *Semiconductor Materials for Optoelectronics and Quantum Devices*, 1st ed. Amsterdam, Netherlands: Elsevier, 2021. ISBN: 978-0128231712.



SARVAJANIK
UNIVERSITY

INCLUSIVE | INTEGRATED | INNOVATIVE
creating an enlightened society...

SARVAJANIK UNIVERSITY

SARVAJANIK COLLEGE OF ENGINEERING AND TECHNOLOGY

BACHELOR OF TECHNOLOGY



CO-PO-Mapping

| CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 |
|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| CO-1 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 2 |
| CO-2 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | 2 |
| CO-3 | 3 | 2 | 3 | 3 | 2 | - | 2 | - | - | - | - | - |
| CO-4 | 2 | 2 | 2 | 2 | - | 2 | 2 | 2 | - | - | - | 2 |

