



**SCHOOL OF ELECTRONICS ENGINEERING
KALINGA INSTITUTE OF INDUSTRIAL
TECHNOLOGY,
DEEMED TO BE UNIVERSITY, BHUBANESWAR
– 751024**

AUTUMN SEMESTER 2023-24

COURSE HANDOUT

Effective from 31/07/2023

BASIC ELECTRONICS

1. Course code: EC 10001

2. Course title: Basic Electronics

3. L-T-P Structure: 2-0-0

4. Course faculty: Prof. Prasanta Kumar Patra

Section: B4,B5 ,B22

5. Prerequisite: Nil

6. Course Objective: The subject is designed to familiarize students of all branches to the all-pervasive field of Electronics, enable them to carry out research in interdisciplinary fields involving semiconductor devices, and utilize the knowledge in solving practical problems in real life in today's age of electronics.

7. Course Outcomes:

At the end of the course, the students will be able to

CO1: Understand the properties of semiconductor and current conduction mechanism,

CO2: Comprehend the working of P-N junction diodes; identify different diode circuits and analyze them,

CO3: Understand the working of different types of transistors,

CO4: Know about OP-AMP and its applications,

CO5: Analyze the working of op-amp using either inverting or non-inverting configurations, timing circuit, regulated power supply ICs, and their applications, and

CO6: Realize the importance of various analog and digital electronic systems and electronic devices.

8. Course Content:

Semiconductors, Diodes and Transistors

Properties of semiconductor materials, Applications of semiconductors as p-n junction diode, Diode characteristics and breakdown mechanisms, Half-wave and full-wave rectifiers with filters, Zener diode, Transistor constructions, operations and their characteristics. Transistor biasing, amplifiers, and load line analysis, Concepts of JFET and MOSFET.

Operational Amplifier (Op-amp) and applications

Introduction to Op-amp and its Characteristics, Application of Op-Amp as Inverting amplifier, Non-inverting Amplifier, Summing, Difference amplifier and comparator

Introduction to Digital Electronics

Different number systems and its conversions, Logic gates and truth tables of OR, AND, NAND, EX-OR. Combinational circuit and Sequential circuit.

Miscellaneous Electronic Devices

SCR, Opto-electronic devices and fiber techniques, Introduction and description of sensor performance, Fundamentals of analog communication techniques (AM and FM).

9.Text Book

1. D. Chattopadhyay and P. C. Rakshit. Fundamentals & Applications, New Age International, 15th Edition 2021.

10. Reference Books

1. R. L. Boylestad & L. Nashelsky, Electronic Devices & Circuits, PHI, 7th Edition, 2021
2. D. A. Bell. Electronic Devices and Circuits. (Oxford) 5th Edition, 2021.
3. J. Millman, Christos C. Halkias & C D. Parikh, Integrated Electronics: Analog and digital circuits and Systems, 9th Edition, 2021.

11. Lesson Plan & Learning Activities

| Day | Topic |
|-----|---|
| 1. | Introduction to the subject and applications of the theories to be taught. Discussion about text book, reference book and course flow |
| 2. | Introduction to Energy band concept of materials, difference between metal, insulator and semiconductor. Intrinsic and extrinsic semiconductors (n-type & p-type) |
| 3. | Current conduction mechanism in Semiconductor. Summary of the chapter and tutorial |
| 4. | Operation of p-n junction diode, diode characteristics |
| 5. | Diode Equation, resistance and Equivalent model. |
| 6. | Operation of Half-wave and full-wave rectifiers |
| 7. | Performance measurement of Rectifiers. |
| 8. | Rectifiers with C, LC filter and LC π filter. Breakdown mechanisms in diode. |
| 9. | Zener diode and voltage regulator. |
| 10. | BJT constructions and its operations. |
| 11. | BJT configurations and α , β & γ relationship. Quiz-1 |
| 12. | CE, CB, CC configurations and characteristics |
| 13. | Dc load line analysis and Q-point. |
| 14. | BJT Biasing and amplifiers. Assignment-1 |
| 15. | JFET concept |
| 16. | MOSFET concept |
| 17. | Summary of the chapter and tutorial |
| 18. | Idea OPAMP, virtual ground, Concept of differential and common mode gain, CMRR |
| 19. | Inverting, Non-inverting and Summing amplifiers |

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|-----|--|
| 20. | Differential amplifier, Comparator. Summary of the chapter and tutorial |
| 21. | Number systems, conversions and codes |
| 22. | Logic gates & truth tables (OR, AND, NAND, EX-OR), Universal gates |
| 23. | Qualitative description of adder, subtractor, |
| 24. | Multiplexer and de-Multiplexer. |
| 25. | Introduction to Flip-flop, RS flip-flop, D flip-flop, JK flip-flop |
| 26. | Shift register and Asynchronous (ripple) counter. Summary of the chapter and tutorial |
| 27. | SCR, opto-electronic devices |
| 28. | Fiber techniques, Introduction and describing sensor performance |
| 29. | Fundamentals of AM, Assignment-2 |
| 30. | Fundamentals of FM. Summary of the chapter and tutorial QUIZ-2 |

12. Internal Assessment Components:

| Sl. No. | Assessment Component | Weightage/Marks | Duration | Nature of the test component |
|---------|----------------------------|-----------------|------------|------------------------------|
| 1 | Mid Semester Exam | 20 | 1.5 Hours | Closed Book |
| 2 | End Semester Exam | 50 | 3.0 Hours | Closed Book |
| 3 | Learning activities | | | |
| | I. Assignment | 15 | Two days | Open Book |
| | II. Quiz | 10 | 20 minutes | Closed Book |
| | III. Critical thinking | 05 | Two days | Open Book |

13. Activity Calendar:

Course coordinator will do.

14. Attendance:

All the students are advised to attend all the classes and minimum 75% attendance is required as per the rules & regulations of the University. Our University is following a continuous evaluation system and the absence may affect the final grading of the student. Continuous evaluation with weight-age of 50 percentage depends on participation in the teaching-learning process, activities and internal assessment. Hence you are advised to participate in all the learning activities without fail.

15. Makeup:

- No make-up examination will be scheduled for the mid semester examination. However, official permission to take a make-up examination will be given under exceptional circumstances such as admission in a hospital due to illness/ injury, calamity in the family at the time of examination.
- A student who misses a mid-semester examination because of extenuating circumstances such as admission in a hospital due to illness / injury, calamity in the family may apply in writing via an application form with supporting document(s) and medical certificate to the Dean of the School for a make-up examination.
- Applications should be made within five working days after the missed examination.

16. Discussion of Mid Semester performance:

Performance of the mid –semester examination will be discussed in class.

17. Pre-end semester total marks: Please see the SAP portal link

18. Course Management System: SAP Portal

Is a software system designed to facilitate teachers in the management (instructional content, assessment and documentation) of the courses for their students, both teachers and students can monitor the system. Though usually considered as a tool and often used to complement the face-to-face classroom.

19. Chamber consultation hour for doubts clarification:

Every Monday & Wednesday from 5:00 PM-6:00 PM

20. Notices:

All course related notification would be conveyed by the course faculty either via the respective Google classroom or WhatsApp group or kiit email.