**20EC1201 – ELECTRONIC DEVICES**

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| **Course category:** | | Program core | | **Credits:** | 3 |
| **Course Type:** | | Theory | | **Lecture - Tutorial - Practical:** | 3 - 0 – 0 |
| **Prerequisite:** | | Engineering Physics. | | **Sessional Evaluation :**  **Univ.Exam Evaluation:**  **Total Marks:** | 40  60  100 |
| **Course**  **Objectives** | Students undergoing this course are expected to understand: | | | | |
| 1. The concepts of Solid State Semi-Conductor Theory. 2. The operation of a PN Junction diode and its applications. 3. The Ideal, Practical and Electrical Characteristics of, Varactor, Tunnel diodes, LED. 4. The need for biasing of Transistor. 5. The working of FET and MOSFET. 6. The working of MOSFET and CMOS circuits. | | | | |
| **Course Outcomes** | Upon successful completion of the course , the students will be able to: | | | | |
| CO1 | | Understand the Semiconductor Physics for Intrinsic and Extrinsic materials and theory of operation of Solid State devices. | | |
| CO2 | | Apply how the properties of semiconductor materials are used for the formation of PN and Zener diodes. | | |
| CO3 | | Explain the functioning of various solid-state devices, including several types of diodes including conventional, Varactor, LED. | | |
| CO4 | | Design the various Bi-polar Junction Transistor biasing circuits and its usage in applications of amplifiers. | | |
| CO5 | | Distinguish the constructional features and operation of FET and their applications. | | |
| CO6 | | Understand the operation of MOSFET and CMOS circuits. | | |
| **Course**  **Content**  **Course**  **Content** | **UNIT-I**  **SEMICONDUCTORS:** Introduction, Classification of Semiconductors, Conductivity of Semiconductor, Energy Distribution of Electrons, Carrier Concentration in Intrinsic Semiconductor, Mass-Action Law, Properties of Intrinsic Semiconductors, Variation in Semiconductor Parameters with Temperature, Drift and Diffusion currents, Carrier Life Time, Continuity Equation.  **UNIT – II**  **PN JUNCTION DIODE:** Introduction, Energy Band Structure of Open Circuited Diode, Quantitative Theory of Diode Currents, Diode Current Equation, Transition Capacitance, Diffusion Capacitance, Temperature Dependence of V-I characteristics, break down mechanisms in semiconductor diodes, Diode as a Circuit Element, Piecewise Linear Diode Model, Applications.  **UNIT –III**  **SPECIAL SEMICONDUCTOR DEVICES:** Introduction, Varactor Diode, Zener diode, LED, Photo diode, Photovoltaic Cell, Solar Cell, UJT.  **UNIT – IV**  **BIPOLAR JUNCTION TRANSISTOR:** Introduction, Transistor Biasing, Operation of Transistor, Types of configuration, Characteristics & current gains (α, β, γ), Introduction to h-parameters.  **UNIT – V**  **JUNCTION FIELD EFFECT TRANSISTOR:** Introduction, Construction, Operation of N-Channel JFET & Characteristics, pinch-off voltage, parameters, Comparison of JFET and BJT.  **UNIT – VI**  **MOS FIELD EFFECT TRANSISTOR:** Introduction, MOSFET, Threshold effect, Enhancement MOSFET, Depletion MOSFET, Long-Channel V-I Characteristics, Non ideal V-I effects, CMOS inverters. | | | | |
| **Text Books and Reference Books** | **TEXT BOOKS:**   1. Electronic Devices & Circuits 4th edition by Jacob Millman & Christos C. Halkias, McGraw- Hill Co. 2. Electronic Devices and Circuits 4th edition by S Salivahanan and [N. Suresh Kumar](https://www.amazon.in/s/ref=dp_byline_sr_book_2?ie=UTF8&field-author=N.+Suresh+Kumar&search-alias=stripbooks) McGraw Hill Education.   **REFERENCES:**   1. Boylestad, Louis Nashelsky “Electronic devices and circuits” 9ed.., 2008 PE. 2. Electronic Devices and Circuits-5th edition, Oxford University Press 3. CMOS VLSI Design : A circuits and systems perspective  4t edition by by   [Neil H.E. Weste,](https://www.amazon.in/Neil-H-E-Weste/e/B001HD2ZP2?ref=dbs_a_def_rwt_hsch_vu00_tkin_p1_i0)[David Harris](https://www.amazon.in/s?ie=UTF8&field-author=David+Harris&text=David+Harris&sort=relevancerank&search-alias=digital-text&ref=dbs_a_def_rwt_hsch_vu00_tkin_p1_i0) | | | | |
| **E-Resources** | 1. https://nptel.ac.in/courses 2. https://iete-elan.ac.in 3. https://freevideolectures.com/university/iitm | | | | |

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| Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low) | | | | | | | | | | | | | | |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | - | - | 2 | - | - | - | - | - | 2 | 2 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 1 | 1 | 2 | - | 1 | - | 3 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | 2 | 2 | - | - | 1 | - | 2 | 2 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 2 | 1 | 2 | - | 1 | 2 | 2 | 3 | 2 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 2 | 1 | 2 | - | 1 | - | - | 3 | 2 | 3 | 3 |
| CO6 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 2 | 3 | 3 |