

UNIVERSITY OF MADRAS
B.Sc. DEGREE COURSE IN PHYSICS
SYLLABUS WITH EFFECT FROM 2020-2021

BPS-CSC10

CORE-X: BASIC ELECTRONICS
(Common to B.Sc.Physics with Computer Applications)

Lecture: 60 Hours

Tutorial: 15 Hours

Credits:4

Course Objectives:

To study the characteristics and application of various semiconductor devices.
To study the basics of electronic Instrumentation.

Learning Outcomes:

On completion of the course the students will be able to

- Handle basic electronic devices like diode and transistor
- Construct amplifiers of different specification
- Apply Barkhausen criteria to oscillators
- Understand the different types of multivibrators
- Get an idea about Instrumentation

UNIT I: SEMICONDUCTORS

(10 Hours)

Band gap-Forbidden Gap-Valence and Conduction Bands-Pure Semiconductors-Impurity in Semiconductors-Energy band Diagram and Fermi level-Fermi Energy and Carrier Concentration of Intrinsic and Extrinsic Semiconductors-PN junction- barrier- Voltage across the junction - Junction Diodes- Zener Diodes- V-I characteristics-Light Emitting Diodes-Photo Diodes

UNIT II : TRANSISTOR AMPLIFIER

(14 Hours)

Transistors- CB and CE modes-Characteristics-Two Port Representation of a Transistor- h-parameters-AC equivalent circuit using 'h' parameters-Analysis of an Amplifier using h parameters (CE configuration only)-Expression for current gain, voltage gain, input impedance, output impedance and power gain- RC Coupled Amplifier - Frequency Response - Analysis of low, mid and high frequency regions - Classification of Amplifiers - Class A Power Amplifier – Push Pull- Class B Power Amplifier - Emitter Follower

UNIT III : OSCILLATORS AND MULTIVIBRATORS

(12 Hours)

Feedback in amplifiers - Effect of Negative Feedback- Barkhuesen Condition For Oscillations - Hartley and Colpit's Oscillators, Phase Shift and Wien's Bridge Oscillators - Expression for Frequency of Oscillation and condition for Oscillation in each case.
Multivibrators - Astable, Monostable and Bistable Multivibrator - using transistors

UNIT IV: SPECIAL SEMICONDUCTOR DEVICES AND WAVE SHAPING CIRCUITS

(12 Hours)

Unipolar Devices- FET – Construction- Working -Characteristics - FET Amplifiers-UJT – Construction-Working- Characteristics - UJT-Saw Tooth Wave Generator- SCR – Characteristics – SCR as a Switch-SCR Rectifier.
Clipping and Clamping Circuits - Biased Clipper - RC Time Constant -Integrating and Differentiating Circuits

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UNIT V: BASICS OF INSTRUMENTATION

(12 Hours)

Definition of measurement and Instrument - Block Diagram of an Instrument – Components – Input, Output, Processing element of an instrument – Functional Elements of Pressure Thermometer– Types of instrument – Basic definition – Accuracy, Precision, Sensitivity, Threshold, Resolution, Drift, Dead Zone, Selectivity, Hysteresis, Range, Bias, Repeatability, Reproducibility – Errors.

Books for Study:

1. Electronic devices and circuits, Theodore F. Bogart, 6th edition, Pearson, 2004.
2. Electronic devices and circuit Theory 11th edition by Robert L. Bolysted and Louis Nashelsky, Pearson, 2017.
3. Elements of Electronics, M.K.Bagde and Singh S.P., S. Chand &Co., New Delhi(1990).
4. Principles of Electronics, V.K. Mehta, Rohit Mehta ,S. Chand & Co.(2006).
5. Applied Electronics , A. Subramanyam ,National Publishing Co.(1997).
6. Hand Book of Electronics, Gupta and Kumar ,PragatiPrakashan,Meerut(2002).
7. Electronics, M. Arul Thalapathi, Comptek Publishers(2005).
8. Elements of Electronic Instrumentation and Measurement, Joseph J Carr, Pearson Education.
9. A course in Electrical and Electronic Measurement and Instrumentation, A. K. Sawhney, DhanpatRai& Co. (Pvt.) Ltd, Nineteenth Revised Edition.(2012).

Books for Reference:

1. Electronic Devices ,Mittal.G.K., G.K. Publishers Pvt. Ltd., (1993).
2. Basic Electronics, B.L. Theraja, S. Chand & Co., (2008).
3. Solid State Electronics, Ambrose and Vincent Devaraj, Meera Publication.
4. Applied Electronics, R.S. Sedha, S. Chand & Co.(1990).
5. Digital Instrumentation, A. J. Bouwen, McGraw Hill,(1986).
6. Electronic Instrumentation andMeasurement Technique, W. D. Cooper and A. D. Helfrick III Edition, Prentice-Hall, India(1991).
7. Instrumentation, devices and systems, Rangan, Sarma and Mani, Tata Mc-Graw Hill
8. Electronic Instrumentation, H. S. Kalsi , Tata Mc-Graw Hill.
9. E-source: <http://www.freestudy.co.uk/instrumentation/>
10. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/122106025/lec39.pdf
11. <https://nptel.ac.in/content/storage2/courses/113106062/Lec13.pdf>