

PARUL UNIVERSITY-FACULTY OF ENGINEERING
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
SYLLABUS FOR 1ST YEAR B. TECH. PROGRAMME (EC, ELECTRICAL,CSE,IT)
BASIC ELECTRONICS (SUBJECT CODE: 03107101)
ACADEMIC YEAR 2015-16

Type of Course: Electronics Engineering

Prerequisite: Knowledge of Physics and Mathematics up to 12th science level.

Rationale: The course provides introductory treatment of the field of Basic of Electronics to the students of various branches of engineering.

Teaching and Examination Scheme:

Teaching Scheme (Hrs/Week)			Credit	Examination Scheme					Total
L	T	P		External		Internal			
				Theory	Practical	Theory	*C.E.	Practical	
3	0	2	5	60	30	20	20	20	150

L- Lectures; T- Tutorial; P- Practical;C.E. -Continuous Evaluation

Contents:

Sr. No.	Topic	Weightage	Teaching Hrs.
1.	Semiconductor and Diode Theory: Conductors, Semiconductors, Silicon crystals, Types of flow, Doping a semiconductor, intrinsic semiconductors, extrinsic semiconductors, Energy level, energy hill, barrier potential and effect of temperature Ideal diodes, unbiased diode, forward bias, reverse bias, breakdown of diode. Calculation of bulk resistance, DC resistance of Diode and Load line, PIV, surge current. Reading a datasheet, Diode as Uncontrolled Switch.	10%	05
2.	Circuits using PN Junction Diode: Half-wave, Full-wave and Bridge rectifier, Clipper Clamper and Limiters, Choke and Capacitor input filter, Voltage Multiplier. Power supply and troubleshooting	10%	05
3.	Special Purpose Diodes: Construction of Zener diode , Characteristics of Zener diode , Application of Zener Diode as Voltage Regulator, load line Optoelectronic devices, Seven Segment Display Schottky diode and its Application, Varactor Diode and its Application, Understanding Datasheets.	10%	04
4.	Bipolar Junction Transistor: Construction, Configurations and Fundamentals: Construction of BJT, Working principle of BJT, Characteristics & specifications of BJT (PNP & NPN transistors), CE, CB, CC configurations, concept of gain & BW. Operation of BJT in cut-off, saturation & active regions (DC analysis). BJT as switch. Single stage BJT amplifier.Understanding Datasheet, Surface mounts transistor and trouble shooting.	20%	10
5.	Transistor Biasing, AC Model, Transistorized Amplifier, Low Frequency Analysis of Amplifier: Biased and unbiased BJT Voltage divider bias and analysis, VDB load line and Q point, two supply emitter biases.Base and Emitter biased amplifier, small signal operation, AC Beta, AC resistance of emitter diode.Voltage gain,loading effect, multistage amplifier.Two port devices and hybrid model, H parameter characteristics, three transistor configuration, transistor amplifier circuit using H parameter, comparison , linear analysis of transistor, physical model of CB transistor.	25%	12
6.	DC Regulated Power Supply: Voltage Regulator-Basic series and shunt regulator, Transistor series Regulator, Regulator Design and performance.Improving Regulator performance-output voltage adjustment, high output current circuit, pre-regulation, constant current source.Fixed and adjustable positive and	25%	12

Sr. No.	Topic	Weightage	Teaching Hrs.
	negative linear voltage regulator, IC linear fixed voltage regulator (78XX, 79XX, LM340 Series), Linear Adjustable Regulator (IC LM317, LM337, and IC 723 IC regulator), Switched mode power supply (SMPS).		

***Continuous Evaluation:**

It consists of assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCO) etc.

Reference Books:

1. Electronic Principles by A. P. Malvino, Tata McGraw Hill Publication New Delhi.
2. Electronic Devices and Circuits by Jacob Millman and Halkias, Tata McGraw Hill Publication New Delhi.
3. Electronic Devices and Circuits by Robert L. Boylestad and Louis Nashelsky, Pearson, Prentice Hall.
4. Electronic Devices by Thomas L. Floyd, Pearson, Prentice Hall.
5. Linear Electronic Circuits and Devices by James Cox, Delmar Publication.
6. Electronic Devices and Circuits by David A. Bell, Oxford Publication.

Course Outcome:

After learning the course the students shall be able to:

1. Understand the concept of intrinsic and extrinsic semiconductor.
2. Understand construction, characteristics of semiconductor devices like diode and bipolar junction transistor.
3. Understand and design circuits using components like diode, BJT, resistors, capacitors, inductors etc.

List of Practical:

Based on Syllabus students shall perform following Practical.

1.	To Plot V-I characteristics Diodes. (a) PN junction diode Characteristic. (b) Zener Diode characteristics.
2.	To Observe Rectifier Circuit (a) Half wave Rectifier without filter (b) Full wave rectifier without filter. (c) Half wave Rectifier with (L,C) filter (d) Full wave Rectifier with (L,C) filter and measure DC voltage regulation and ripple factor for various load currents in case of filtered output.
3.	Designing of power supply using IC regulator circuit. (c) Designing of +5 Volt DC Power Supply using 7805. (d) Designing of -5 Volt DC Power Supply using 7905. (e) Designing of +12 Volt DC Power Supply using 7812. (f) Designing of -12 Volt DC Power Supply using 7912.
4.	To Observe Response of Clipping and Clamping circuits using diodes. (a) Diode Positive Clipper without and with Biased clipper (b) Diode Negative Clipper without and with Biased clipper. (c) Biased Positive – Negative Clipper (Combinational Clipper) (d) Positive Clamper, Negative Clamper.
5.	(a) To Plot and Study input-output characteristics of common Base (CB) configuration of Transistor (b) To Plot and Study input-output characteristics of common Emitter (CE) configuration of Transistor
6.	To study Voltage divider bias circuit: (a) To observe the effect of change in base current on Q-operating point (b) To set Q point for operation of transistor amplifier in linear region.
7.	Study of Single Stage RC Couple Amplifier: Biasing, Voltage gain and observe frequency response of amplifier also find out its [1] cutoff frequency [2] bandwidth [3] mid band gain.

8.	Optoelectronic devices: (a) To plot characteristics of LED (b) To plot Characteristic of Photo Diode (c) To observe isolated control of optocoupler.
9.	To plot characteristics of Schottky and Varactor diode.
10.	Designing of Linear Adjustable Regulator using IC LM317
11.	Introduction to simulation tools Multisim and Designing of hybrid two port network using Multisim.
12.	Simulation of Different Transistor Biasing Techniques in Multisim Software. (a) Self Bias (b) Voltage Divider Bias (c) Emitter Resistor Bias

Project:

Students shall carry out projects based on theory and practical, either individually or in groups. Following are definitions of some of sample projects.

1. Design, fabrication and testing of mains operated 12V, 1A unregulated power supply, using capacitive filter.
2. Design, fabrication and testing of mains operated 12V, 1A regulated power supply using discrete components.
3. Design, fabrication and testing of mains operated dual (+15V, 1A and -15V, 1A) regulated power supply using IC regulator.
4. Design, fabrication and testing of mains operated adjustable positive and negative voltage *regulated* power supply using IC regulator. (The range of output voltage should be from \pm (1.2 V to 15 VDC), 1 A each.
5. Design, fabrication and testing of mains operated voltage regulator *regulated* power supply using IC regulator having following outputs.
 - a. \pm 5 VDC, 1A each.
 - b. \pm (1.2 V to 15 VDC), adjustable output
6. Design, fabricate and test constant current source using Zener Regulator.
7. Design, fabrication and verification of fixed and voltage divider bias for BJT amplifier.
8. Design and set up a single stage RC-coupled CE amplifier using bipolar junction transistor and plot its frequency response.
9. Multiple RF switch using PIN diode
10. Light sensor using BJT and LDR.
11. Meter protection using Zener diode.
12. LED pattern generator
13. Paddle power phone charger.

Major and Minor Equipments:

1. Regulated Power Supplies (Single and Dual)
2. C.R.O/D.S.O
3. Function generator
4. Digital multimeter
5. Breadboard, soldering machine, soldering wire
6. Diodes: P-N diode, ZENER, schottky, varactor, LEDs, PIN
7. Optoelectronic devices: LDR, Phototransistor, photodiode.
8. Transistor: BC-547, BC-557, SL/CL 100, 2N3055, 2N3077 etc.
9. Power supply ICs: 78XX, 79XX, LM317, LM340, LM377
10. Kits available in laboratory

