semester - I
Semester - II
Semester - III
Semester - IV

Complementary - Electronics for Physics

Semester I

EC1C01_ Basic Electronics

Aims and Objectives

- Electronic systems are built with components like resistance, capacitance, diodes, transistors, etc. The intention of the course is to create awareness about the principle and working of the commonly used components in electronic systems. Upon completion of the course the student is expected to be able to identify, use and check various electronic components.

No. of contact hours : 36
Credits : 2

Module I (6 hrs)

Introduction to circuit components

Resistor General information such as symbols, colour codes, types, variable resistors, potentiometers, thermistors, LDRs, VDRs, technical specifications like voltage rating.- Capacitors General information such as symbols, colour codes, types, fixed and variable Capacitors- Specifications, Voltage Rating Inductors symbols, types, such as air core, iron core, chocking core, frequency response relays symbols types application area- Microphone & Speaker Frequency response, Impedance, rating, size, transducers.

Ref: Basic Electronics Theraja

Semiconductor Diode Devices (6 hrs)

Semiconductors- Energy bands in semiconductors Intrinsic and Extrinsic semiconductors- P type and N type semiconductors Majority and minority carriers- PN junction Properties of PN Junction Biasing- V-I Characteristics of PN Junction-Semiconductor Diode-Zener Diode Zener diode as voltage regulator.

Ref: Principles of Electronics. V. K Mehta & Rohit Mehtha

Module II (6hrs)

Applications of Semi Conductor Diodes

Half Wave Rectifier- Full Wave Rectifier Bridge Rectifier (Efficiency and Ripple Factor with derivation) - Filter Circuits- Advantages and use of filters-Shunt capacitor filter, LC filter, RC filter Clipper, Clamper.

Ref: Principles of Electronics. V. K Mehta & Rohit Mehtha

Special diodes (6hrs)

LED s- Multi colour LED Applications of LED Schottky diode Tunnel diode-Photo Diode Solar cell Varactor Diode Principle of operation and Characteristics.

Ref: Electronic Principles, Malvino

Module III

Network Analysis (6 hrs)

Thevenin's theorem, Norton's theorem, Super position theorem, Maximum Power transfer theorem. Voltage Source, Current source.

Ref: Network Theory and Filter Design- Aatre.

Transistors (6 hrs)

Transistor: PNP and NPN transistors- Different configurations- CE, CB, CC- amplifying action- Current gain- α, β and their relation • transistor characteristics in the three configurations • BJT factors contributing to Thermal Stability- stability factor S- Operating Point • Voltage divider Bias • Base resistor feed back • Potential divider Bias.

Ref: Principles of Electronics. V. K Mehta & Rohit Mehtha.

Practical I
List of Experiments

No. of contact hours : 36
Credits : 1

1. CRO familiarization- measurement of ac voltage, dc voltage- measurement of frequency.
2. PN junction diode characteristics.
3. Zener diode characteristics.
4. Half wave rectifier
5. Full wave rectifier with and without filter.
6. Series voltage regulator using Zener.
7. Regulated Power Supply using IC.
8. Clippers - positive, negative, biased.
9. Clampers- positive, negative.

Semester II

EC2C02_ Amplifiers, Oscillators and Power Electronics

Aims and Objectives

- This course intends to impart to the student basic knowledge of the various types of amplifiers, oscillators and also basic ideas of power electronics. On completion the student is expected to be familiar with the design aspects of amplifiers.

No. of contact hours : 36
No. of Credits : 2

Module I
Transistor Amplifier (12 hrs)

Amplifier classification based on operating point, frequency, coupling element Single stage CE amplifier with voltage divider bias • AC analysis- DC analysis- gain in decibels • voltage gain • current gain- input impedance- output impedance •power gain.

Ref: Principles of Electronics. V. K Mehta & Rohit Mehtha

Module II

Feedback Amplifiers (6hrs)

Principles of feed back circuit • Stabilization of gain by negative feed back- Reduction of non-linear distortion by negative feed back- Effect of feed back on input and output resistances • Voltage series feed back • Emitter follower • Current series feed back.

Ref: Principles of Electronics. V. K Mehta & Rohit Mehtha

Oscillators (6hrs)

Feed back requirements of Oscillators •Barkhausen criteria for Oscillations Basic Oscillator Analysis • Phase Shift Oscillator • Hartley Oscillator • Collpits Oscillator, Piezo-electric Crystal Oscillator.

Ref: Principles of Electronics. V. K Mehta & Rohit Mehtha [Chapter 17]

Module III

Field Effect transistors (6 hrs)

JFET- Principle and Working- JFET as Amplifier-operating point • FET biasing- fixed bias • self bias- voltage divider bias- Applications.

Ref: Principles of Electronics. V. K Mehta & Rohit Mehtha [Chapter 22]

Power Electronics (6hrs)

TRIAC • construction-operation-characteristics-DIAC-UJT- UJT- characteristics.

Ref: Principles of Electronics. V. K Mehta & Rohit Mehtha [Chapter 24]

Practical II

List of Experiments

No. of contact hours : 36
No. of Credits : 1

1. RC integrator.
2. RC differentiator.
3. Common Base characteristics.
4. Single stage CE amplifier.
5. Hartley oscillator.
6. Colpitts oscillator.
7. JFET characteristics.
8. Emitter follower
9. Photodiode characteristics

Semester III

EC3C03_ Operational amplifiers, Integrated circuits and Communication electronics

Aims and Objectives

- The advent of integrated circuit technology is the cause of all modern developments in electronic industry. The objective of the course is to introduce the techniques of IC fabrication, discuss the basic principle of working of operational amplifier. The course also aims to provide rudimentary ideas of electronic communication.

No. of contact hours : 54
No. of Credits : 2

Module I
OP amp theory (18 hrs)
Basic concepts Schematic diagram of 741-Ideal Operational amplifier- Practical inverting OP-AMP- Practical non-inverting OP-AMP - DC analysis- Ac Analysis- The differential amplifiers- OP- Amp Parameters- Input bias current- Input offset current-Input offset voltage-Input Common mode Range-Power Supply Voltage rejection Ratio-Output Voltage Swing(Range)- Slew rate- Full Power Band Width- -Applications of OPAMP-adder Circuit - Integrator Differentiator- voltage comparator.

Ref: Integrated Electronics Millman & Halkias

Module II
Integrated Circuits (18 hrs)
IC classification- monolithic IC techniques- Planar process- Bipolar transistor fabrications- Monolithic diodes- Resistors-Capacitors- IC Packaging- Preparation of thin films.

Ref: Micro Electronics Millman & Grabel.

Module III
Communication Electronics (18 hrs)
Principles of A.M. Side band frequencies of A M wave-Power in AM wave-Transistor A.M modulator-Frequency modulation (Qualitative study only)-Essentials of demodulation of AM wave. A.M. Radio receiver-Super heterodyne receivers- Pulse modulation-PAM, PTM, PCM, PPM. (Basic ideas)
T.V. fundamentals-Block diagram of monochrome T.V.transmitter and receiver-Scanning-Aspect ratio-Basic ideas of LCDTV-Plasma TV HDTV

Ref: Electronic communication systems-George Kennedy &Bernard Davis

Practical III
List of Experiments

No. of contact hours : 36
Credits : 1

1. OP- AMP- - inverting amplifier.
2. Non-inverting amplifier using OP- AMP
3. OP- AMP - comparator, buffer.
4. OP- AMP- integrator.
5. OP- AMP- differentiator.
6. OP-AMP-Square Wave generator using OP-AMP
7. Amplitude Modulation
8. Demodulation
9. PCB Fabrication

Semester IV

EC3C03 Digital Electronics

Aims and Objectives

- Computers and many other sophisticated electronic devices are working on Digital electronic principles. The aim of the course is to impart sufficient knowledge of these principles. The course also aims to provide basic ideas of memory devices.

No. of contact hours : 54
No. of Credits : 2

Module I

Number Systems (5 hrs)

Number Systems-Decimal-binary -Hexadecimal-BCD-conversion between different systems- Binary Arithmetic

Boolean Algebra and Minimization techniques (6hrs)

Boolean Logical operations-AND-OR-NOT-Basic laws & Property of Boolean Algebra-Principle of Duality -Demorgan-s Theorems- Sum of Product(SOP) and Product of sum(POS)-Minterm-Maxterm-Deriving SOP and POS from Truth Table-Karnaugh Map-simplification of a Boolean expression four-variable K-map

Ref:Digital Circuits and Design S Salivahanan and S Arivazhagan [Ch I&2]

Logic Gates (7hrs)

Review of AND, OR, NOT, XOR, NAND, NOR gates and their Truth Table. TTL and CMOS gates. Adders-Half Adder- Full Adder- 4 bit Adder- Subtraction circuits-Encoders- Decoders

Ref: Integrated Electronics Millman & Halkias

Module II

Flip Flops (18 hrs)

Types of Flip Flops(FF)- S-R FF-[NOR and NAND based] Clocked S-R FF- D FF- J-K FF - T FF Master-Slave FF- Race around condition- Applications of FF- Shift registers-Serial in Serial out - Parallel in Parallel out- Serial-in-parallel out-parallel in serial out- Counters- Ripple counter- Ring counter- Synchronous Counters- Synchronous Up/down Counter - Design of Mod-10(decade) counter. D/A Converters-Weighted resistor type D/A Converter- R-2R Converters- A/D Converter - Counter type A/D Converter.

Ref: Integrated Circuits Millman & Hallkias

Module III [18 hrs]

Memory Devices

Memory Devices-Magnetic tapes-Hard disc-Floppy disc-C.D. -Rewritable C.D.-D.V.D. - Bubble memory-Memory card-Memory button - Pen drive Classification of Memories- Registers-RAM-SRAM-DRAM-ROM-PROM-EPROM-EEPROM-

Ref: Microprocessor architecture, programming and applications with the 8085- Ramesh Gaonkar

Practical IV

List of Experiments

No. of contact hours : 36
Credits : 1

1. Verification of Truth table of Logic gates using IC.
2. Verification of De-Morgan's laws using IC.
3. Verification of truth table of JK flip- flop.
4. Shift register using IC.
5. Ripple counter using IC.
6. Ring counter using IC.
7. Decade counter using IC.
8. **A**/D Converter
9. D/A Converter

Complementary Course

Electronics for Physics

Scheme

Semester	Title of the paper	Number of hours per week	Number of credits	Total Credits	Total hours/ semester	University Exam Duration	Weightage	
							IA	EA
1	**EC1C01 Basic Electronics** **Practical I**	2 2	2 1	3	72	3 hrs	1	3
2	**EC2C02 Amplifiers, Oscillators and Power Electronics** **Practical II**	2 2	2 1	3	72	3	1	3
3	**EC3C03 Operational amplifiers, Integrated circuits, Communication electronics** **Practical III**	3 2	3 1	4	90	3	1	3
4	**EC4C04 Digital Electronics** **Practical IV**	3 2	3 1	4	90	3	1	3