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Course	Name of the Course	Lect./ Hrs./ Week	Internal Marks	External Marks	Total Marks	Course Credits
ELE-401	Solid State Physics and Semiconductor Devices	**4**	**30**	**70**	**100**	**4**
ELE-402	Electronic Communication-I	**4**	**30**	**70**	**100**	**4**
ELE-403	Linear IC's and their applications	**4**	**30**	**70**	**100**	**4**
ELE-404	Digital system design and Microprocessor-I	**4**	**30**	**70**	**100**	**4**
ELE-405 PR ELE-406 PT	Practicals Projects	**6** **6**	**30** **30**	**70** **70**	**100** **100**	**4** **4**
TOTAL		**28**	**180**	**420**	**600**	**24**

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ELE– 401: ELEMENTS OF SOLID STATE PHYSICS & SEMICONDUCTOR DEVICES

To discuss conduction in metal crystals and several properties of metals, semiconductors and superconductors.
To understand the most of the semiconductor devices contains the junctions. The performance of function such as rectification, amplification switching and other operations in the electronic circuits. These devices are particularly well suited for controlled switching between conducting states and non conducting states.

UNIT I : Energy Bands: Introduction, nearly free electron model, Origin of the energy gap, Magnitude of energy gap, Bloch function, The Kroning-Penney model, Wave Equation of electron in a periodic potential, solution of central equation, approximate solution near a zone boundary, No. of orbitals in a band.

UNIT II : Super conductivity : Introduction, Meissner effect, heat capacity , energy gap, isotope effect, thermodynamics of super conducting transitions. London equation, coherence length, BCS theory of superconductivity, Flux quantization, Type I and Type II superconductors, Single particle tunneling,, Josephson superconducting tunneling(AC and DC), macroscopic quantum interference.

UNIT-III : BJT: BJT fabrication, Switching- Cut-off, Saturation, Switching cycle, Specification for switching transistors.
Gummel-Poon model, Kirk-effect,
Frequency limitations of transistors- Capacitance and Charging time, Transit time effect, Webster effect, High frequency transistors.

UNIT-IV: JUNCTIONS, FET, MOSFET: Introduction to Fabrication of p-n junctions- Thermal oxidation, Diffusion, ion implantation, Etching
Metal – Semiconductor junctions- Schottky barriers, Rectifying contacts, Ohmic contacts, Typical Schottky barriers, Heterojunctions.

FET and MOSFET: Introduction to JFET, JFET and MESFET, I-V characteristics, MOSFET structure and fabrication, MOS capacitor.

Reference Books:

1. **C. Kittel,** Introduction to solid state physics: 7th ed. Johj Wiley pub. Ltd.
2. **Jaspreet Singh**, Semiconductor devices (basic principles) John Wiley & sons (Asia) pvt Ltd.
4. **Ben G. Streetman,** Solid state electronic devices, Prentice Hall of India.
5. **S.M.Zee,** Physics of semiconductor devices**,** Wiley Eastern Limited, New Delhi.
6. **Dennis Le Croissette,** Transistors, Prentice Hall of India.
7. **G.N.Garud and L.C.Jain,** Electronic devices and linear circuits, Tata McGraw-Hill Publishing Company Limited, New Delhi.
8. **S.S. ISLAM (OXFORD),** Semiconductor Physics & Devices

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ELE– 402: ELECTRONIC COMMUNICATION –I

This paper covers elements of radio wave propagation, microwave communication and antenna designing. It also includes digital communication. This paper provides good grounding in electronic communication

UNIT I : Transmission Lines & Microwave Waveguides:

Transmission Lines: Introduction, Primary Line Constants, Phase Velocity and Line Wavelength, Characteristic Impedance, Propagation Coefficient, Phase and Group Velocities, Standing Waves, Lossless Lines at Radio Frequencies, Voltage Standing-wave Ratio, Slotted-line Measurements at Radio Frequencies, Transmission Lines as Circuit Elements, quarter wave line, stub line Smith Chart, Time-domain Reflectometry.

Microwave Waveguides: Introduction, Rectangular waveguides : solution of wave equation, rectangular coordinates, TE modes in rectangular waveguides, TM modes in rectangular waveguides, power transmission in rectangular waveguides, excitation of modes in rectangular waveguides, characteristics of standard rectangular waveguides, circular waveguides : solution of wave equation in cylindrical coordinates, TE and TM modes in circular waveguide.

UNIT II: Radio wave Propagation : Propagation in Free space: mode of propagation, Tropospheric Propagation : mode of propagation, radio horizon, attenuation in atmosphere, Ionospheric Propagation : ionospheric layers, mechanism by which ionsophere effects wave propagation, plasma frequency and critical frequency, refraction of radiowaves, Secant law and MUF, skip distance, virtual height, effects of earth's magnetic field, service range, ionospheric irregularities and fading, Surface Wave : mode of propagation, ground wave

UNIT-III: Antenna Theory & Designing: Hertzian dipole, half wave dipole, quarter wave monopole antenna, small loop antenna, Antenna characteristics, Antenna arrays. Antenna with parabolic reflectors, Horn antenna, log periodic antenna

UNIT-IV: Digital communication: Synchronization, probability of Bit error, bit error rate, QAM, Bandwidth efficiency, carrier recovery, clock recovery, DPSK, error performance of various digital communication systems, Eye diagrams.

Reference Books:

1. **Dennis Roddy and John Coolen,** Electronic Communications, (Fourth edition), Prentice Hall of India.
2. **Samuel Y. Liao,** Microwave Devices and circuits, Prentice Hall of India.
3. **D.C.Sarkar,** Microwave Propagation and Technique, S.Chand and Company Ltd. New Delhi.
4. **George Kennedy,** Electronics and Communication systems, McGraw Hill International Edition.
5. E**dward C. Jordan and Keith G. Balman,** Electromagnetic waves and Radiating systems, Prentice Hall of India.
6. **Robert E.Collins,** Antennas and radiowave propagation, McGraw Hill Book Company, India.
7. **Wayne Tomasi**, Advanced electronic communication systems. PHI.
8. **Mathew N.O.Sadiku,** Elements of Electromagnetics, Oxford Uni. Press.

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ELE– 403: LINEAR IC's AND THEIR APPLICATIONS

Linear IC's is a very important area in the study of Analog Electronics and many experiments based on this paper are included in practical. This provides good understanding and is useful to develop circuits.

UNIT I : Comparators & Power Amplifiers :
Comparators : Comparator characteristics, Limitations of OpAmp as comparator, Voltage Limiters, High Speed and Precision type Comparator, Window detector - IC LM 1414, IC-BB 4115.
Level detector for photodiode using LM311, ON/OFF Temperature controller using LM 339
Power amplifier: IC LM 380 and LM 384.

UNIT II : Waveform Generators and Converters:
Waveform Generators: Phase shift Oscillators, Wein bridge Oscillators, Quadrature Oscillators, Square Wave Generator, Triangular Wave Generator, Saw-tooth Wave Generator.
Voltage Controlled Oscillator - IC 566 , Function Generator - IC 8038
Converters : V to F and F to V converters - IC 9400

UNIT III: Signal processing circuits:
Active Filters -Second & Higher order band pass filter (wide/narrow), Band reject filter (Wide/narrow), All pass filter. Universal Active Filter, FLT-U2,Switched Capacitor Filter,MF-5

UNIT IV :Special Purpose Amplifiers:
Opamps using FET input stages, tone controls and graphic equalizers, Video Amplifiers LM 733 and RCA 3040, Norton's OpAmp-LM 3900, Norton OpAmp in inverting and Non inverting configuration.

Reference Books:
1. **Gayakwad,** OpAmp. and Linear Integrated circuits, PHI. (3rd Ed.)
2. **K.R.Botkar,** Integrated circuits, Khanna Prakashan, (8th Ed).
3. **Coughlin and Driscoll,** Operational Amplifiers and Linear integrated circuits, PHI

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ELE– 404: Digital System Design & Microprocessor–I

Digital logic design forms a backbone of digital electronics. It aims to enhance the designing skills of students for combinational and sequential logic circuits. Modern concept of designing using VHDL is introduced. The microprocessor study provides the student in depth knowledge of hardware of computers.

UNIT I :

a. Combinational Logic Design : Design of code converters : BCD to Decimal, Decimal to BCD using universal gates

b. Design of synchronous sequential digital circuits : Concepts of excitation (transition) tables, Synthesis rules of transition tables, Design of MOD-3, MOD-5, Decade Counter using J-K Flip Flop

c. Design of Driver circuits : Seven segment decoder driver, Multiplexed display

Introduction to HDL, Overview of Digital System Design using HDL, Verilog HDL : VHDL Code, Gate level implementation, VHDL Operators, Basic Combinational logic circuits

UNIT II :

a. Design of 1Hz precise clock generators using conventional and special IC's.

b. Design of a preset timer using magnitude comparator, counter, decoder and display with 1 Hz precise clock.

c. Design of digital stop watch using CMOS IC's.

d. Design of time base circuit to obtain 1 MHz, 100 kHz , 10 kHz, 1 kHz, 100 Hz, 10Hz, 1 Hz, 0.1 Hz, 0.01 Hz.

e. Design of frequency counter/period measurement

f. Design of Real time digital clock using special IC's.

Data flow modeling of HDL, Basic arithmetic and combinational logic circuits using VHDL

UNIT-III Code Conversion, BCD Arithmetic, 16- Bit Data Operations and Interrupt

BCD-to-Binary Conversion, Binary-to-BCD Conversion, BCD-to-Seven-Segment-LED Code Conversion, Binary-to-ASCII-to-Binary Code Conversion, BCD Addition , BCD Subtraction, Introduction to Advanced Instructions and Applications, Multiplication, Subtraction with Carry, the 8085 Interrupt.

UNIT-IV Programmable Interface Devices: 8155 I/O and Timer; 8279Keyboard/Display Interface

Basic Concepts in Programmable Devices, The 8155: Multipurpose Programmable Device, The 8279 Programmable Keyboard/Display Interface .

General - Purpose Programmable Peripheral Devices

Introduction to the 8255A Programmable Peripheral Interface (PPI), Illustration: Interfacing Keyboard and Seven-Segment Display, Illustration: Bidirectional Data Transfer Between Two Microcomputers, The 8254 (8253) Programmable Interval Timer, The 8259A Programmable Interrupt Controller Direct Memory Access (DMA) and the 8237 DMA Controller.

Reference Books:

1. **Vibhute & Borole**.8-Bit Microprocessor System Design
2. **M. Morris Mano,** Digital Design, 3rd Ed., Pearson Education Asia.
3. **D.P. Leach, A.P. Malvino, G. Saha,** Digital Principles and Applications 6th Ed., McGraw Hill Companies.
4. **D.C.Green,** Digital Electronics and Technology, a.h.Wheeler & Co.
5. **Thomas Bartee,** Digital computer fundamentals, 6th Ed. T MH
6. **John F. Wakerly**, Digital Design principles and practices,
7. **Bhasker,** A VHDL Primer, 3rd edition - PHI, New Delhi, 2007
8. **Sudhakar Yalamanchili,** Introductory VHDL : From Simulation to Synthesis – Pearson Education Asia., 2001
9. **Charles H.Roth Jr**, Digital Systems Design using VHDL, PWS Pub.,1998
10. **Stephen Brown & Zvonko** , Fundamentals of Digital Logic with VHDL Design
11. **Vranesic** – Tata McGraw Hill, 2002
12. **R.S.Gaonkar,** Microprocessor Architecture, programming and applications,
13. **P.K. Ghosh & P.R. Sridhar**, 0000 to 8085 Introduction to microprocessors for engineers and scientists.
14. **B.Ram,** Microprocessors and Microcomputers, Dhanpatrai and Sons.

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ELE– 405: PRACTICALS

LIST OF PRACTICALS:

1. Astable multi-vibrator using OP-AMP
2. R-C Phase shift oscillator using OP-AMP
3. PLL Application Synthesizer,
4. PLL Application AM Demodulator, FM Demodulator
5. Schmitt trigger using OP-AMP
6. Non linear characteristics of OP-AMP
7. Active filter using OP-AMP - Notch Filter, Narrow Band Pass filter.
8. Hall Effect
9. Transistorized mixer circuit
10. counter using microprocessor I
11. microprocessor Experiment II
12. ExpEyes based experiments I
13. ExpEyes based experiments II
14. Study of IC 733 Amplifier
15. Study of IC 3900 Amplifier

15% of new experiments can be introduces AND / OR replaced as per the need, with the permission of the Head. Total of at least 10 Experiments to be done.

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ELE– 406: PROJECT
