

Curriculum for Electronics



CHRIST
UNIVERSITY
B A N G A L O R E , I N D I A

Declared as Deemed to be University under Section 3 of UGC Act 1956

UNDER GRADUATE DEPARTMENT OF ELECTRONICS

CHRIST UNIVERSITY
BANGALORE – 560 029

2013 – 14 BATCH ONWARDS

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CHRIST UNIVERSITY, BANGALORE-29

DEPARTMENT OF ELECTRONICS

APPROVED B.Sc. SYLLABUS

UNDER DEEMED UNIVERSITY SYSTEM (2013-14 BATCH ONWARDS)

SUBJECT: ELECTRONICS

Course Objective

The course aims at providing theoretical and practical exposure to a varied range of electronics and communication technologies. It is diversified greatly in order to keep in pace with recent trends and developments and the fast changing needs of the society.

The three years of study starts from the fundamentals of electronics, semiconductor devices and applications, operational amplifiers and applications, digital electronics, radio and television communication, satellite communication, fiber optic communication, digital and advanced communication systems, microprocessor and microcontroller applications, electronic instrumentation etc. Students are required to complete a project work as a part of the curriculum.

After completing this three-year degree course, students can opt for higher studies; get into R & D institutions like IISc, ISRO, DRDO, BEL, BHEL, ITI etc, electronics industry or IT enabled service sections.

Methodology

Apart from conventional methods of teaching, audiovisual interactive sessions, CBT, interaction with experts from Industry, quiz, seminars and Industry visits are adopted. The lab sessions include systematic training in circuit designing, assembly, measurements, trouble shooting and analysis. The individual and group projects carried out by the students under the guidance of industry experts and teachers enable them to develop confidence and competence in the application of electronics. Lab manuals are prepared by the faculty and given to the students for reference.

COURSE STRUCTURE- ELECTRONICS UG

I SEMESTER

Course code	Title	Hours	Marks	Credits
ELE 131	Electronic Devices and Applications	4	100	3
ELE 151	Practical-I	2	50	1

II SEMESTER

Course code	Title	Hours	Marks	Credits
ELE 231	Operational Amplifiers and Linear Integrated circuits	4	100	3
ELE 251	Practical-II	2	50	1

III SEMESTER

Course code	Title	Hours	Marks	Credits
ELE 331	Digital Electronics	4	100	3
ELE 351	Practical-III	2	50	1

IV SEMESTER

Course code	Title	Hours	Marks	Credits
ELE 431	Electronic Communication Systems	4	100	3
ELE 451	Practical-IV	2	50	1

V SEMESTER

Course code	Title	Hours	Marks	Credits
ELE 531	Computer Hardware and Verilog	3	100	2
ELE 532	Microprocessor and Interfacing	3	100	2
ELE 551	Practical-V	2	50	1
ELE 552	Practical-VI	2	50	1

VI SEMESTER

Course code	Title	Hours	Marks	Credits
ELE 631	Microcontroller and Applications	3	100	2
ELE 632	Electronic Instrumentation	3	100	2
ELE 651	Practical-VII	2	50	1
ELE 652	Practical-VIII	2	50	1

ELECTRONICS PAPERS

ELE 131: Electronic Devices and Applications

This paper enables the students to understand.

- The basic methods of solving electrical dc networks using different network theorems.
- The designing of half wave rectifier, full wave rectifier, filter circuits and clippers and clampers
- The basic theory of bipolar junction transistor, various transistor-biasing techniques and transistor applications
- The principles of field effect transistor and applications, switching devices

ELE 231: Operational Amplifiers and Linear Integrated Circuits

This paper enables the students to understand

- . The basic theory of differential amplifier and construction of Op-amp using differential amplifiers
- The Op-amp characteristics and applications
- Basic principles of oscillators and applications
- Principle and applications specialized ICs like 555 timer LM 317, 78xx and 79xx series.

ELE 331: Digital Electronics

After completing this paper, students will be able to understand

- Basics of number systems, codes, Boolean algebra and logic gates
- Different logic families and characteristics
- The design of combinational circuits
- The design of sequential circuits and theory of various memory devices

ELE 431: Electronic Communication systems

This paper enables the students to understand

- Principles of radio and television
- The theory of transmission lines, Antennas
- Basics of pulse ,digital and advanced communication systems
- Theory and applications satellite communication
- Theory and applications of optical fiber communication

ELE531: Computer Hardware and Verilog

This paper enables the students to understand

- Fundamentals of PC and different part of a Computer
- PC assembling and Disassembling

- Basic concepts of verilog programming
- Modules and various modeling techniques.

ELE 532: Microprocessor and Interfacing

This paper enables the students to understand

- Basics of microcomputer and microprocessor 8085
- Instruction set and Programming of microprocessor 8085
- Interfacing with 8085
- Features and modes of PPI 8255

ELE 631: Microcontroller and Applications

This paper enables the students to understand

- Basics of microcontroller
- Instruction set and Programming of microprocessor 8051
- Interfacing with 8051
- Features of PIC microcontroller

ELE 632: Electronic Instrumentation

This paper enables the students to understand

- Performance characteristics and applications of electronic instruments
- Principle and applications of electrical transducers
- Signal conditioning concepts and circuits
- Data acquisition and electronic instruments

CHRIST UNIVERSITY, BANGALORE-29

DEPARTMENT OF ELECTRONICS

APPROVED B.Sc. SYLLABUS (2012-13) ONWARDS

SUBJECT: ELECTRONICS

SEMESTER I

ELE 131: ELECTRONIC DEVICES AND APPLICATIONS (60hrs)

UNIT 1:DC Network Analysis (12hrs):

Review of passive components, Ohm's law, voltage and current sources.

DC resistive networks: Transient response, RC circuit, charging & discharging of capacitor in RC circuit, derivation for instantaneous charge, voltage and current in the circuit. meaning of time constant , expression, graphical representation. numerical problems.

RL circuit , growth and decay of current, derivation for instantaneous current in the circuit. meaning of time constant , expression, graphical representation. numerical problems.

Network Theorems: voltage divider theorem, current divider theorem , Kirchoff's Laws (loop equations only), superposition theorem, Thevenin's theorem, Norton's theorem, conversions, maximum power transfer theorem – statement, explanation, numerical examples.

UNIT 2: Diode Applications (13 hrs)

Semiconductor Diode: P-N junction, forward and reverse bias of a p-n junction, diode symbol, V-I characteristics of p-n junction. dc forward resistance, ac forward resistance, parameters of the p-n junction (breakdown voltage, knee voltage, maximum forward current, peak inverse voltage, maximum power rating, bulk resistance).

Zener diode: Equivalent diagram of zener diode. zener and avalanche breakdown mechanisms in diodes, zener diode characteristics. zener diode as voltage a regulator- line and load regulation, expression for $R_s(\min)$, $R_s(\max)$, $I_z(\max)$, $I_z(\min)$ (no derivation), numerical problems.

Rectifiers: Half wave rectifier, center tap full wave rectifier and bridge rectifier –circuit diagram, working, input and output wave form, expression for I_{dc} , I_{rms} , ripple factor, efficiency (no derivation), PIV of diode and frequency of output in each case. advantages and disadvantages of each type of rectifiers, comparison of rectifier circuits, numerical problems

Filter circuits :Types of filters: series inductor filter, shunt capacitor filter, LC filter, Π filter, circuit diagram, input and output wave form, expression for ripple factor (no derivation), performance and comparison.

Voltage Multipliers: Half wave voltage doubler, full wave voltage doubler, voltage tripler - circuit diagram and working.

Clipping circuits and Clamping circuits: Positive clipper, negative clipper, biased clipper, and combinational clipper, circuit diagram and working, input and output wave form, positive clamper and negative clamper, input and output wave forms, numerical problems.

UNIT 3: Bipolar Junction Transistor (06 hrs)

Introduction to transistors-Transistor construction, transistor symbol, different methods of transistor biasing, operation of NPN and PNP transistor, transistor currents, input and output characteristics of CE configuration. comparison of CE, CB and CC configurations.

Transistor Biasing: Need for biasing, The dc operating point and load line, factors affecting stability of Q point, stability factor definition.

Methods of transistor biasing: Fixed bias, fixed bias with emitter resistor and voltage divider bias circuits-circuit diagram, explanation, derivation for operating point and stability factor, advantages and disadvantages. Numerical problems

UNIT 4: Transistor Applications (14hrs)

Transistor as an amplifier: Classification of amplifiers. small signal operation of CE amplifier: various circuit current, phase reversal, ac and dc equivalent circuits, r_e model, derivation of input resistance, output resistance, current gain, voltage gain, power gain,. hybrid parameters (qualitative), expression for h_{fe} , h_{ie} , h_{re} , h_{oe} , numerical problems

Multistage Amplifiers: Introduction, gain of multistage amplifier, decibel gain .power gain, types of coupling, analysis of a two stage RC coupled amplifier, frequency response, expression for over all gain (no derivation) , band width, advantage and disadvantage of RC coupling, direct coupled amplifier, frequency response, calculation of voltage gain., advantages and disadvantages of direct coupling

Power Amplifiers: Introduction, difference between voltage and power amplifiers, ac load line, classification of power amplifiers, Class A amplifier: power relation in Class A amplifier, overall efficiency of class A amplifier, resistive load and transformer coupled, over all efficiency of transformer coupled class A amplifier, limitations. Class B amplifier: characteristics, push-pull operation, maximum efficiency of class B push –pull amplifier, crossover distortion, and complementary symmetry amplifier, working numerical examples

Transistor Tuned Amplifier: Need for tuned voltage amplifier, resonance- series and parallel, impedance, resonance curve, characteristics of series resonance, single tuned voltage amplifier, frequency response of single tuned voltage amplifier, advantage and

limitation of single tuned amplifiers, double tuned voltage amplifier, frequency response of double tuned voltage amplifier, limitations and applications.

UNIT 5: Field –Effect Transistors (10 hrs)

Construction and working of JFET, drain characteristics, transfer characteristics, JFET parameters, FET approximation- Shockley's equation, CS FET amplifier, working, comparison between BJT and JFET ,numerical examples.

MOSFET: Depletion type MOSFET, construction, working, drain and transfer characteristics, symbol.

Enhancement type MOSFET, construction, working, drain and transfer characteristics, symbol, MOSFET applications.

Switching devices: UJT-construction, working, characteristics, SCR–construction, working, characteristics, diac, triac- characteristics and application.

Self study Topics (5 hours)

Energy band description of semiconductors. Intrinsic and extrinsic semiconductors, p type semiconductor, concept of hole current , n type semiconductor, n type conductivity, p type conductivity majority and minority charge carriers.

Special semiconductor devices- Tunnel diode, Varactor diode, Schottky diode, LEDs, seven segment display, LCD, Photo diode, solar cell.

Recommended Text Books:

1. A.P Malvino, *Principles of Electronics*, 7th ed.TMH, 2011.
2. Robert L Boylestad, *Introductory circuit analysis*, 5th ed.,Universal Book Stall 2003.
- 3.R.S.Sedha, *A Text book of Applied Electronics*, 7th ed., S.Chand and Company Ltd. 2011

Reference Books:

1. T.F. Bogart. Beasley, *Electronic Devices and circuits*, 6th ed, Pearson Education, 2004.
2. N.N. Bhargava, D.C Kulshreshta, and S.C Gupta, *Basic Electronics and Linear Circuits*, 40th Reprint ,TMH, 2005.
- 3.Robert Boylestad and Louis Nashelsky, *Electronics Devices and circuit theory*, 8th ed, Pearson Education, 2004
4. T.L.Floyd, *Electronic Devices and circuits*, 5th ed.PHI, fifth , 2005.
5. V.K. Metha, Rohit Mehta, *Principle of Electronics*, 11th ed., S.Chand and Company Ltd, 2011

ELE 151: Practical I

List of experiments (Practical I)

Study of resistance color code, soldering practice, test and measuring instruments and Ohm's Laws (1 practical class)

1. Kirchhoff's Laws
2. Superposition Theorem
3. Thevenin's Theorem
4. Maximum Power Transfer Theorem
5. Semiconductor diode and Zener diode characteristics
6. Half wave rectifier with and without capacitor filter
7. Center tap full wave rectifier with and without capacitor filter
8. Voltage tripler using diodes
9. Zener regulator- Line and Load regulation
10. Fixed bias circuit with emitter resistor
11. Voltage divider bias circuit
12. CE amplifier- Frequency response

Reference Books: Basic Electronics- A Text Lab Manual, Paul B Zbar, A.P. Malvino, TMH, 7th Edition, 2002

UNIT	Hours	Marks	Part A (4)	Part B (10)
1	12	28	2	2
2	15	32	3	2
3	08	18	2	1
4	15	32	3	2
5	10	18	2	1
	Total= 60	Total= 128	12	08

SEMESTER II

ELE 231: OPERATIONAL AMPLIFIERS AND LINEAR INTEGRATED CIRCUITS

UNIT1: Differential amplifiers (5 hrs)

Differential amplifier, different types of circuit configurations, dc analysis - dual input balanced output configurations, operating points(derivation), differential input resistance, output resistance, voltage gain (expression, definition)) , comparison of different configuration of differential amplifier, inverting and non inverting inputs, CMRR, expression, current mirror circuit, differential amplifier with current mirrors, current mirror as tail current, current mirror as active load.

UNIT 2 : Op-amp theory(10 hrs)

Op-amp block diagram, equivalent circuit, pin diagram of IC 741, specification, characteristics of ideal and practical op-amp, op-amp parameters- input bias current, input offset voltage, output offset voltage, slew-rate, open loop op-amp, limitations, op-amp negative feedback, block diagram of a voltage series, voltage shunt, current series, current shunt feedback circuits, inverting and non-inverting voltage feedback- circuit, derivation for voltage gain(In terms of open loop voltage gain, in terms of feedback resistance), input and output impedance (circuit diagram and derivations). virtual ground, bandwidth..

UNIT 3: Op-amp applications (10 hrs)

Adder- inverting and non-inverting, subtractor, scale changer, buffer, comparator- basic comparator, zero cross detector and Schmitt trigger, comparator characteristics, numerical problems

Active Filters: Classification of filters, advantages of active filters, types of filters. first order Butterworth filters: low pass, high pass, gain derivation and frequency response, filter design (problems), frequency scaling ,second order Butterworth low pass and high pass filters, voltage gain (no derivation), frequency response graph, band pass, band reject and all pass filter, circuit diagrams and frequency response.

UNIT 4: Oscillator circuits (15 hrs)

Sinusoidal Oscillators:

Classification of oscillators, basic principle, block diagram of feedback circuit, negative feedback, positive feedback explanation, expression of gain with positive feedback, explanation of damped, growing and sustained oscillations with sine wave. Barkhausen criterion for sustained oscillations. noise voltage as starting voltage. concept of parallel resonance. LC tank circuit, principle , damped and undamped oscillation, expression for frequency in terms of L & C. necessary conditions for sustained oscillations.

Transistor Oscillators:

Hartley oscillator: Circuit diagram, explanation, circuit operation, expression for frequency of oscillation, feedback ratio, gain for sustained oscillation.(no derivation). numerical problems.

Colpitt's oscillator: Circuit diagram, explanation, circuit operation, expression for frequency of oscillation, feedback ratio, gain for sustained oscillation.(no derivation). numerical problems.

Limitations of LC oscillators.

Op- amp Oscillators:

RC oscillators, basic principle of RC oscillators, phase shift oscillator- circuit diagram, principle, working, expression for frequency of oscillation, feedback ratio, gain for sustained oscillation (no derivation), numerical problems.

Wien bridge oscillator – circuit diagram, principle, working, expression for frequency of oscillation, feedback ratio, gain for sustained oscillation (no derivation), numerical problems.

Crystal oscillators- Piezo electric effect, equivalent circuit of crystal and applications.

Non-sinusoidal Oscillators:

Classification of non-sinusoidal oscillators, transistor as a switch, transistor multivibrators, types of multivibrators.

astable multivibrator- circuit diagram, waveforms, circuit operation, ON time, OFF time expressions, expression for frequency of oscillation, numerical problems. applications.

monostable multivibrator- circuit diagram, waveforms, circuit operation, expression for pulse width. applications.

bistable multivibrator-. circuit diagram, waveforms, circuit operation, applications.

square wave generator using op-amp.

UNIT 5: Specialized IC applications (15 hrs)

IC 555 timer:

Pin diagram, functional block diagram, explanation

Astable multivibrator- circuit diagram, schematic diagram, waveforms, expressions for charging time constant, discharging time constant, duty cycle and frequency of oscillation, numerical problems. applications.

Mono-stable operations- circuit diagram, schematic diagram, waveforms, expressions for pulse width. applications.

Voltage controlled oscillator, Schmitt trigger- circuit diagram, schematic diagram, waveforms, saw tooth generator , circuit diagram, schematic diagram, waveforms,

Phase-locked loop - operating principle, block diagram, explanation. monolithic PLL-IC 565, pin diagram, functional block diagram 565 PLL, application in frequency multipliers.

power amplifiers using power boosters. monolithic power amplifiers – LM 380 as power audio amplifier.

voltage regulators, fixed and variable, 78xx series and 79xx series, working, pin out diagram and applications.

IC LM 317 as a variable voltage regulator, numerical problems.

switching regulator-block diagram, explanation.

power supply- block diagram explanation, circuit diagram and explanation for +5V and -5V supply design.

Self Study Topics (5 hrs)

Introduction to IC's: Advantages, limitations, linear and digital ICs, examples, scale of integration, development of ICs, fabrication techniques, latest trends in IC technology.

Special purpose op-amps- specification, characteristics and comparison, interpretation of data sheets

Feedback in amplifiers, types of feedback, advantages and disadvantages, applications

Recommended Text Book:

Ramakanth Gayakwad, *Operational amplifier and linear circuits*, 3rd ed., PHI, 2005.

Reference Books:

1. T.F. Bogart and Beasley, *Electronic devices and circuits*, 6th ed., Pearson Education, 2004.
2. A.P Malvino, *Electronics principles*, 7th ed., TMH, 2011.
3. T. L. Floyd, *Electronic devices and circuits*, 5th ed., PHI, 2005.
4. Sedra and Smith, *Micro electronics circuits*, 5th ed, Oxford University Press, 2001

ELE251: Practical II

List of experiments

1. Colpitts oscillator
2. Construction of regulated power supply using IC 7805 and IC 7905
3. Op-amp adder, subtractor and scale changer
4. Phase-shift oscillator using IC 741
5. Wien-bridge oscillator using IC 741
6. Op-amp comparator
7. Hartley oscillator
8. Astable multivibrator using transistors
9. Current and voltage regulation using IC LM 317
- 10 Op - amp inverting amplifier
- 11 Crystal oscillator
12. Monostable multivibrator using IC 555

Reference Books: Paul B Zbar, A.P. Malvino, *Basic Electronics- A Text Lab Manual*, TMH, 7th ed., TMH, 2002

BLUE PRINT

II Semester

UNIT	Hours	Marks	Part A (4)	Part B (10)
1	5	14	1	1
2	15	32	3	2
3	10	18	2	1
4	15	32	3	2
5	15	32	3	2
	Total= 60	Total= 128	12	08

SEMESTER III

ELE 331: DIGITAL ELECTRONICS (60 Hrs)

UNIT 1: Number systems: (6 hrs)

Decimal, binary, octal and hexadecimal and their inter conversion. digital codes, BCD (8421) code, gray, excess 3, alphanumeric codes-ASCII, Arithmetic operation in binary and hexadecimal, BCD addition, and excess 3 addition, Sign magnitude conversion, 1's and 2's complements subtraction, signed number arithmetic addition.

UNIT 2: Logic gates and Boolean algebra (12 hrs)

Positive and negative logic, basic logic gates, AND, OR and NOT gates, Boolean algebra-laws and theorems, NAND and NOR gates, De-Morgan's theorems, XOR and XNOR gates- symbol, truth table, realization using basic gates, NAND and NOR gates as universal gates. Simplification of logic expression using Boolean algebra, SOP and POS expression, Karnaugh maps, K-map technique to solve 3 and 4 variable equations, don't care conditions.

UNIT 3: Pulse characteristics and logic families (10 hrs)

Pulse characteristics- ideal and practical pulse, rise time, fall time, turn on time, turn OFF time, pulse width, duty cycle, classification of digital IC's, characteristics of digital IC's- propagation delay, power dissipation, fan-in, fan-out, current and voltage parameters, power supply requirements,
TTL families- characteristics, standard TTL NAND circuit with totem pole output, comparison of propagation delay time and power dissipation of different TTL families,
MOS Logic (NMOS, PMOS) – characteristics, CMOS logic- NAND gate and NOR gate inverter.

UNIT 4: Combinational logic circuits (13hrs)

Arithmetic logic circuits –half adder, full adder, 4-bit parallel binary adder, half and full subtractors, two bit and 4-bit magnitude comparators, IC 7485- pin diagram, decimal to BCD encoder, priority encoder, applications, decoders, BCD to decimal decoder, BCD to decimal decoder (mention only).

Multiplexers-4: 1, 8:1 and logic diagram and truth table of each, applications, Demultiplexers-1: 4, 1:8 and logic diagram and table of each, applications

Introduction to programmable logic devices-ROM organization-combinational circuit implementation using ROM-programmable logic array(PAL)-PAL programming table – implementation of Boolean function (half adder) using PAL-programmable logic array(PLA)-PLA programming table - implementation of Boolean function using PLA-comparison of programmable logic devices.

UNIT 5: Sequential logic circuits (13 hrs)

Flip- flops – basic RS latch (NAND and NOR latches), clocked RS flip-flops, D flip- flop and JK flip- flop, T flip-flop, edge triggering and level triggering,edge triggered master-slave JK flip-flop, clear & preset inputs. IC 7473 and IC 7476, shift registers– 4 bit serial in serial out, serial in parallel out, parallel in serial out, parallel in parallel out.

Counters: Asynchronous counters, logic diagram, truth table and timing diagrams of 3 bit ripple counter, 4 bit up-down counter, mod n counters, 4-bit synchronous counter, decade counter. IC 7490, synchronous 2-bit and 3-bit counter design using K-maps, ring counter, Johnson counter, applications.

Self Study Topics (6hrs):

Digital Computer Fundamentals: Evolution of digital computers, computer generations, single chip microcomputers, digital computers, personal computers, block diagram of digital computers, hardware ,software and firm ware, computer languages, algorithms, flowcharts, architecture of computers, operating systems.

Memory Devices: Introduction –primary and secondary memories, RAM –static and dynamic, ROM, EPROM & EEPROM –memory capacity, advantage, disadvantage and application, secondary memory, hard disc, CD ROM, memory capacity, advantage, disadvantage and applications, basics of DVD and flash memory.

Recommended Text Books:

1. A Anand Kumar, *Fundamentals of digital circuits*, 3rd ed.,PHI, 2011.
2. T.L.Floyd , *Digital fundamentals*, 8th ed.,Universal Book Stall,2005.

Reference books:

1. R.P Jain , *Modern Digital Electronics*, 4th ed.TMH , 2010.
2. M. Morris Mano, *Digital logic and computer design*, 4th ed., PHI 2009
3. Malvino and Leach, *Digital principles and application*, 5th ed., TMH, 2000.
4. Ronald J Tocci, *Digital systems: principles and applications*, 10thed.,Pearson education, 2009.
5. A.P.Malvino and J.A. Brown, *Digital Computer Electronics*, 3rd ed.,TMH, 2008

ELE 351: Practical III**List of experiments**

1. Realization of basic gates using diode and transistor
2. Realization of basic gates using NAND gates using IC 7400
3. Realization of basic gates using NOR gates using IC 7402
4. Half adder and half subtractor using NAND gates
5. Full adder using IC 7486 and IC 7400
6. Binary to Gray code and Gray code to Binary conversion
7. Clocked RS, D Flip-flops using NAND gates
8. 4 –bit binary ripple up counter using IC 7476/74107
9. Decade counter using IC 7490.
10. Study of De-Multiplexer using IC 74154
11. Study of Multiplexer using IC 74150

Reference books:

1. Malvino and Leach, *Experiments in Digital Electronics*, 4th ed. TMH, 2000.
2. K A Krishnamurthy, *Digital Lab Primer*, 3rd ed., Pearson Education, 2003.

III semester: BLUE PRINT

UNIT	Hours	Marks	Part A (04)	Part B (10)
1	06	12	3	-
2	12	28	2	2
3	12	28	2	2
4	15	28	2	2

5	15	32	3	2
	Total= 60	Total= 128	12	08

SEMESTER IV

ELE 431: ELECTRONIC COMMUNICATION SYSTEMS (60 hrs)

UNIT I: Modulation and Demodulation (12 hrs)

Introduction to communication system. ,block diagram of general communication system. Concept of noise; types of noise –internal and external noise, signal to noise ratio, noise figure.

Modulation-need for modulation, types of modulations. amplitude modulation –wave form representation, expression for instantaneous voltage frequency spectrum. modulation index, power relations-, modulation by several sine waves. generation of AM principle, requirements. block diagram of AM transmitter ,function of different stages.

Frequency modulation- frequency deviation, carrier swing, modulation index ,deviation ratio and percentage modulation. block diagram of FM Transmitter, comparison of AM and FM , numerical problems.

Demodulation- need for demodulation. characteristics of radio receiver , AM Detectors, diode and transistor detectors, SHD AM receiver-principle, block diagram with AGC, FM receiver block diagram, FM detectors.

UNIT 2: Transmission lines, Antennas (6 hrs)

Transmission line–two wire parallel line, coaxial line ,wave guides optical fiber cable, ideal transmission line. equivalent circuit of transmission line –diagrams for low frequency and for high frequency equivalent .Primary and secondary constants, transmission line parameters-definitions only

Antenna: radiation mechanism-evolution of the dipole from open circuited transmission line, antenna equivalent circuits, elementary doublet, radiation pattern ,antenna parameters-definitions only, various types of antennas and applications, antennas used in mobile communications (qualitative).

UNIT 3: Television (9 hrs)

Introduction to TV-basic principles of picture transmission –scanning horizontal and vertical scanning , interlaced scanning –explanation with diagram, requirements and advantages .horizontal and vertical scanning frequencies and calculations-numerical problems. progressive scanning, TV camera tube-vidicon –diagram, principle and working, composite video signal-diagrammatic representation & explanation of various components, blanking & synchronizing pulses, vestigial side band transmission – explanation with diagram

TV Systems &Standards-NTSC,PAL &SECAM. comparison, basic principles of color TV-primary and secondary colors, compatibility, color combinations-chromo & luminescence processing as per PAL system-luminance equation, numerical problems.

Color TV transmitter and receiver -simplified block diagram of PAL color TV receiver – function of each block.

Unit 4: Pulse , Digital and Advanced communications (13 hrs)

Pulse communication: Introduction, characteristics of data transmission circuits-Shannon limit for information capacity bandwidth requirements, data transmission speeds, sampling theorem, pulse modulation types-PAM, PWM, PPM, brief description, waveforms, PCM-brief description and block diagram.

Digital communication–introduction to digital modulation. FSK, PSK and ASK- brief description, waveforms, advantages disadvantages and applications. modems-classifications, modes of modem operation.

Concept of cellular mobile communication-cell and cell splitting, frequency response, roaming and hand off, block diagram of cellular mobile communication system, simplified block diagram of cellular phone hand set, advantages and disadvantages.

Study of GSM & CDMA system: other wireless system: LAN, Wi-Fi, Blue Tooth standards ,Wi-max (mention only), brief description of Long Term Evolution (LTE), 3G, 4G technologies.

UNIT5: Satellite Communications (7 hrs)

Introduction and the need of a satellite, the launching of a satellite, the use of Kepler's laws in satellite communication, satellite orbits, satellite system-block diagram of satellite sub systems (space segment), station keeping, attitude control, ground station (simplified block diagram of earth station), uplink, downlink, cross-link (no block diagrams) transponder (C-band multi channel), satellite band width, frequency reuse, solar panels. multiple access methods - TDMA, FDMA, and CDMA. ,GPS (qualitative only).

UNIT 6: Optical fiber Communications (7 hrs)

Introduction-need for optical fiber communication, block diagram of OFC system, core and clad concept,

characteristics and classification of optical fiber, light propagation through optical fiber, Light sources-requirements and examples. construction and working of unguided LASER diode.

Photo detector –PN photo diode PIN photo diode requirements and examples, construction and working of avalanche photo diode, advantages and disadvantages of optical fiber communication, losses in optical fiber cables, applications of optical fiber communication.

Topics for Self Study (6 hrs)

Radiation and propagation of waves: EM spectrum, terrestrial propagation of EM waves: ground wave space wave (line of sight) propagation, sky wave propagation, formation of ionosphere, importance.

radio broadcasting stations in India (AM & FM), history of Indian satellites.

Modern trends in TV : Digital TV - composite digital standards - MPEG standard – digital transmission - cable TV - cable frequencies –TV channels- co-axial cable for CATV - cable distribution, DTH technology, applications, LCD TV, Plasma TV, HD TV, LED TV.

Recommended Text Books:

1. Dennis Roddy & John Coolen, *Electronic Communication*, 4th ed., PHI, 2002

2. George Kennedy & Bernad Davis, *Electronic Communication systems*, 4th ed., TMH, 2005

3. Wayne Tomasi , *Advanced Electronic Communication System*, 6th ed., PHI, 2005.

Reference Books:

1. Wayne Tomasi ,*Electronic Communication systems:Fundamentals through advanced* ,5th ed., Pearson education, 2005

2. Louis Frenzel, *Communication Electronics*, 3rd ed.,TMH, 2002.

ELE 451: Practical IV

List of Experiments:

1.Astable Multivibrator using IC 555

2.Amplitude modulator and demodulator

3.First order active low pass and high pass filter

4.Tuned amplifier

5.PWM and PPM using IC 555

6.FSK modulation using IC 555

7.ASK Modulation using Op-Amp

8. Frequency Mixer using IC 565

9.Optical fiber experiments -Characterization of 660 nm LED and study of fiber optic intensity modulation system for analog transmission.

10. PAM using transistor.

Reference Books:

1.Poorna Chandra Rao & Sasikala, *Handbook of experiments in electronics and communication*,2nd ed. VIKAS publishing house, 2004.

2. Paul B Zbar, A.P.Malvino & M.A. Miller, *Basic electronics-A text lab manual*, 7th ed.,ed.,TMH, 2002.

BLUE PRINT

UNIT	Hours	Marks	Part A (04)	Part B (10)
1	15	28	2	2
2	06	18	2	1
3	12	28	2	1
4	13	28	2	2
5	07	18	2	1

6	07	18	2	1
	Total= 60	Total= 128	12	08

SEMESTER V

ELE 531: COMPUTER HARDWARE AND VERILOG (45 hrs)

UNIT 1: Computer hardware (15 hours)

Review of computer fundamentals, Basic block diagram, hardware, software, firmware, interpreter, and assembler, microprocessors, memory, motherboards, power supply, SMPS, floppy disc drive, hard disc drive, DVD ROM /CD writer, mouse, keyboard, Modems, sound card, scanners, I/O Ports and devices, monitors, printers, laptops, notebook, study of computer virus, anti virus, internet and e-mail.

UNIT 2: PC assembling and disassembling(10 hours)

Regular maintenance and trouble shooting , operating systems and application software basics, installation of windows OS, Linux , Microsoft office products, Hard drive installation, Installation of windows OS, Linux , Microsoft office products, Hard drive installation and partitioning, copying files from one computer to another computer, CD-ROM installation, Installation of printer, Serial device installation.

UNIT 3: Introduction to VERILOG (6 HOURS)

Introduction, representation of digital circuits in verilog, structural specification of logic circuits, verilog syntax, behavioral specification of logic circuits, how not to write verilog code, verilog for combinational circuits and sequential circuits,

UNIT 4: VERILOG design (14 hrs)

Modelling concepts- top-down and bottom-up design methodology, modules, instances, lexical conventions - data types: value set, nets and variables, vectors, strengths, implicit net declarations, net initialisation, net types, regs, arrays, parameters. Expressions: operators, operands, delay, maximum and minimum delay expressions. Modules and ports, events, race conditions, assignments, gate level modelling, data flow modelling, behavioral modelling, structural modelling.

Recommended Text Books:

- 1.Cheryl A. Schmit ,*The complete Repair textbook*, 3rd ed., Dreamtech Publishers, 2002
2. Samir Palnikar, *Verilog HDL guide to digit design and synthesis*, 3rd ed., Pearson education, 2012.
- 3.N Mathivanan, *Microprocessors, PC Hardware and Interfacing*, 7th ed. PHI, 2009.

Reference Books:

1. David Groth ,A+ Core Module Study Guide, 2nd ed., BPB publications, 2003,
2. Stephan Brown and Zvonko Vranesic, *Fundamentals of digital logic with Verilog design*, 2nd ed., TMH, 2002

ELE 551: Practical V

List of Programs/Experiments:

1. Write a Verilog program to implement basic gates.
2. Write a Verilog program to implement half adder and full adder.
3. Write a Verilog program to implement half subtractor and full subtractor.
4. Write a Verilog program to implement 1x2mux.
5. Write a Verilog program to implement 2x1demux.
6. Write a Verilog program to implement D and JKFlip Flops
7. Write a Verilog program to implement Up and Down Counters.
8. Windows practicals
9. Study of CPU and Mother board parts
10. Study of HDD and keyboard circuit assembly
11. Study of printers and SMPS
12. Hardware assenbling and disassembling lab

UNIT	Hours	Marks	Part A (4)	Part B (10)
1	15	40	4	3
2	10	32	3	2
3	06	18	2	1
4	14	32	3	2
	Total= 45	Total= 128	12	08

SEMESTER V

ELE 532: MICROPROCESSOR AND INTERFACING (45 hrs)

UNIT 1: Introduction to microprocessors(5 hrs)

Introduction to microprocessor, applications, basic block diagram, speed, word size, memory capacity, classification, features of 8085, architecture of 8085—block diagram, internal registers, register pairs, flags, stack pointer, program counter, types of Buses. clock circuit, pin diagram of 8085.

The evolution of processors from 8085 to pentium and till date..

Instruction-operation code, operand, M

UNIT 2: 8085 Instruction set (15 hrs)

Instruction-operation code, operand, mnemonics, instruction set, instruction classification, addressing modes. data transfer and memory operations, arithmetic operations, increment & decrement operations, logical operations, branch operations, stack operations, I/O and machine control operations, interrupts. delay loops, use of counters, timing diagrams—T- states, instruction cycle, machine cycle, op- code fetch, I/O read, I/O write, memory read, memory write.

UNIT 3: Programming of 8085 (15 hrs)

Programs for data transfer and memory operations (direct & indirect addressing), addition and subtraction of two 8-bit & 16-bit numbers, multiplication, display of smallest / largest number in a given array of numbers, sorting of numbers in descending / ascending order. number of 1's and 0's in a given byte, testing for zero condition. 1's and 2's complement verification of truth tables of logic gates.

UNIT 4: Interfacing of 8085 (10 hrs)

Basic interfacing concepts, compatible ICs of μ P 8085, data transfer, synchronous I/O data transfer using interrupts. memory interfacing—address decoding, interfacing RAM and ROM, interfacing I/O devices—input port, output port, IN & OUT instructions, interfacing input devices interfacing output devices (LED display interfacing-block diagram), switch interfacing, programmable peripheral interface IC 8255—features, pin diagram, functional block diagram, ports & their modes,

Recommended Text Book:

Ramesh S Gaonkar, *Microprocessor Architecture, Programming and Applications with 8085*, 4th ed., Wiley Eastern Limited, 2003

Reference Books:

1. B.Ram, *Fundamentals of Microprocessor & Microcomputer*, 4th ed., Danpat Rai Publication, 2000
2. Aditya P Mathur, *Introduction to Microprocessors*, 3rd ed., TMH, 2000

ELE 552: Practical VI

List of Programs/Experiments:

(Any six programs)

1. Program to add & subtract two 8- bit numbers
2. Program to add two 16 bit numbers
3. Program to subtract two 16 – bit numbers
4. Program to multiply two 8-bit numbers
5. Program to find the square of an 8-bit number
6. Program to display the smallest number in a given array of numbers
7. Program to find the number of zeros and ones in a byte
8. Display of numbers from 00 to 99

Interfacing experiments (Any two experiments)

1. LED interfacing using PPI 8255
2. Square wave generator using PPI 8255
3. Switch interfacing
4. Relay interfacing
5. Digital IC testing
6. Digital multiplexer

Reference Books:

1. K A Krishnamurthy, *Microprocessor Lab primer*, 2nd ed., Interline publishing Co, 2000.
2. B.Ram, “Fundamentals of Microprocessor & Microcomputer”, 7th ed., Danpat Rai Publication, 2000

UNIT	Hours	Marks	Part A (4)	Part B (10)
1	05	18	2	1
2	15	42	3	3
3	15	42	3	3
4	10	26	4	1
	Total= 45	Total= 128	12	08

SEMESTER VI

ELE 631: MICROCONTROLLER AND APPLICATIONS (45 Hrs)

UNIT 1: Introduction to Microcontrollers (3 hrs)

Introduction, basic building blocks of a micro controller, comparison between microprocessor and micro controller, types of micro controllers Intel's MCS-51, Atmel 89Cxx, 89cxx51, PIC micro controller by Microchip. qualitative description of CISC and RISC processors. Harvard and Von-Neumann Architectures.

UNIT 2: 8051 Microcontroller (15 hrs)

Salient features of 8051 uC, basic block diagram of 8051 uC, pin description- functions of various pins of 8051.

Memory Organization – data and program memory.

Structure of internal data (RAM) memory- description of register banks, bit addressable RAM area and general purpose (scratch pad) RAM in 8051 uC.

Brief description of external data memory and associated signals. block diagram representation.

Program memory structure – internal program memory, block diagram representation, address range and associated signals. external program memory, block diagram representation, address range and associated signals. block schematic of interfacing of external program memory.

Special Function Registers (SFRs) - bit addressable SFRs and byte addressable SFRs in 8051. brief description of each SFR.

Basic oscillator circuit, reset circuit for 8051. interrupt structure in 8051- interrupt sources and their vectors (ISR address), initializing interrupts and interrupt priorities. Qualitative description of timer/counters and serial communication.

UNIT 3: Instruction Set and Assembly Language Programming (12 Hrs)

Instruction format, addressing modes: immediate, register, direct, register indirect, indexed and implied addressing modes. definition and example for each addressing mode.

Instruction Set of 8051- Classification of instructions based on the function: data transfer instructions, arithmetic instructions, logical instructions, branching operations, bit processing (Boolean variable manipulation) instructions. brief description of each instruction with examples.

Assembly language program examples: Data transfer operations with internal and external memory, 8 and 16 bit arithmetic operations; addition, subtraction, multiplication and division. logical operations, truth table verification, sorting of numbers in an array, implementing BCD, hex decimal counters.

Introduction to Development tools, software simulators- qualitative only.

UNIT 4: Interfacing and Applications (10 hrs)

Introduction to interfacing. General structure of I/O Ports in 8051. internal structures of Port0, Port1, Port2 and Port3, schematic representation, brief description of each.

Interfacing examples: Interfacing LED to 8051, circuit diagram, assembly language program to flash LED with a suitable time delay.

Interfacing a 7 segment display unit to 8051, circuit diagram and assembly language program to display 0 to 9 on the display unit. Interfacing of push button, relay- basic circuit arrangement and assembly language programs.

Interfacing of LCD module with 8051. basic circuit, algorithm, interfacing a digital to analog converter IC (DAC) to produce square, triangular and ramp waveforms. PWM wave generation using 8051, qualitative description of advanced applications of micro-controllers.

UNIT 5: Fundamentals of PIC Microcontroller (5 hrs)

Overview and features of 16C 6x/7x, functional blocks of PIC 16C61: ALU, CPU Registers, FSR, INDF, program counter- brief description of each.

Pin diagram of PIC 16C61 and PIC 16C71, description of each pin.

Qualitative description of memory organization: program memory and data memory. PIC RESET actions: Power On Reset, Brown Out reset, definitions, oscillator connections in PIC, circuit schematic and description.

PIC 16F8XX Flash micro controllers- important features, advantages of flash memory, qualitative description.

Recommended Text Books:

1. Muhammad Ali Mazidi and Janice G Mazidi & Rolin.D McKinlay, *The 8051 microcontroller and embedded system*, 2nd ed., Pearson Prentice Hall, 2008
2. Kenneth J Ayala, *"The 8051 microcontroller Architecture programming and Applications*, 2 ed., Pen Ram International Publishing PVT. Ltd, 2005

Reference Books:

1. Ajay Deshmukh, *Micro controller, Theory and applications*, PHI
2. Raj Kamal, *Microcontroller Architecture programming Interfacing and system design*, Edition 2005 Pearson Education.
- B.Ram, *Fundamentals of Microprocessor & Microcomputer*, 7th ed., Danpat Rai Publication, 2000
3. Douglas V Hall, , *Microprocessor and Interfacing*, 3rd ed., TMH, 2000

ELE 651: Practical VII**List of Programs**

1. Program to add & subtract two 16- bit numbers
 2. Program to multiply& divide two 8-bit numbers
 3. Program to display the smallest number in a given array of numbers.
 4. Program to find the ascending /descending order of the numbers given in an array
 5. Program to find the square of a 8 bit number
 6. Program to implement BCD up counter from 00 to 99
 7. Interfacing with keyboard
 8. Interfacing with 7 segment LED
 9. Interfacing with DAC/waveform generation
 10. Interfacing with stepper motor
 11. PWM generation
-

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UNIT	Hours	Marks	Part A (4)	Part B (10)
1	03	08	2	-
2	15	42	3	3
3	12	32	3	2
4	10	32	3	2
5	05	14	1	1
	Total= 45	Total= 128	12	08

ELE 632: ELECTRONIC INSTRUMENTATION (45 hrs)

UNIT 1: Introduction (5 hrs)

Performance characteristics: static and dynamic. errors in measurement, types of errors, sources of errors (qualitative), dynamic characteristics- speed, lag, fidelity and dynamic error, dynamic response- zero order, II and I order instruments -expression, description and examples.

UNIT 2: Transducers (14 hrs)

Introduction, electrical transducers, advantages, selecting a transducers, classification of transducers- passive, active, digital and analog types, definition and examples

Resistive transducers- strain gauge- theory, types- unbonded, bonded metal wire, foil and semiconductor type, basic theory, advantages, disadvantages.

Thermistor- construction, types, resistance- temp characteristics, applications

Thermocouple- principle of operation, advantages and disadvantages, IC temperature sensors LM 34/35 (mention only), resistance thermometer – construction, advantages, limitations, inductive transducers-reluctance type- construction, working

Linear variable differential transformer (LVDT) - construction, working, advantages.

Capacitive transducer-principle, pressure transducer- construction, working.

Photo electric transducers, photovoltaic cell, photo diode and photo transistor- working principle, applications, piezo electric transducer, working principle, applications.

UNIT 3: Signal Conditioning (8 hrs)

Introduction, block diagram of signal conditioning, review of op-amp basics, op-amp basic block diagram. voltage to current converter, current to voltage converter, expression for output. Integrator, differentiator using IC 741 - derivation for output and waveforms. practical differentiator, practical integrator

Basic Instrumentation amplifier- important features, differential instrumentation amplifier using transducer bridge, output voltage derivation, logarithmic amplifier, circuit description and output expression.

UNIT 4: Data Acquisition and Conversion (6 hrs)

Introduction, general data acquisition system (DAS), objective of DAS, single channel and multi channel DAS block diagrams qualitative description.

Digital to analog converter- R-2R ladder and binary weighted ladder circuits, brief analysis. D to A using op-amp summing amplifier. analog to digital converter- successive approximation method, Flash ADC, block diagram explanation.

UNIT 5: Electronic Instruments (12 hrs)

Digital voltmeter- features, advantages and performance characteristics, digital voltmeter types, ramp type digital voltmeter, dual slope type digital voltmeter,- block diagram, working principle, advantages and disadvantages, digital multimeter, Electronic Counter, frequency meter, capacitance meter- block diagram, working and applications, resolution

and sensitivity of digital multimeter,. oscilloscopes-analog dual trace type, block description and principle of operation.

Storage oscilloscopes- analog and digital principle of operation. basic spectrum analyzer-concept and block diagram, qualitative description.

Bio-Medical instrumentation- Bioelectric potentials, ECG, EEG, EMG, ultrasound, pacemaker, X-ray machines

Recommended Text Books:

H.S.Kalsi, *Electronic Instrumentation*, 2nd Edition, TMH, 2005

Reference Books:

1. W.D. Cooper, A.D. Helfrick, *Electronic Instrumentation and measuring Techniques*, 3rd ed., PHI, 2000
2. A.K. Sawhney, *A Course in Electrical, Electronics Measurement and Instrumentation*, 12th ed., Dhanpat Rai & sons, 2000
3. C.S.Rangan, G.R.Sarma, VSV Mani, *Instrumentation devices and systems*, TMH, 2000

ELE 652: Practical VIII

PART A : Instrumentation Experiments (20 marks)

(Any FOUR experiments) – 4 practical classes.

List of Experiments:

1. Op-amp Integrator –Frequency response & waveforms.
2. Op-amp Differentiator –Frequency response & waveforms.
3. Capacitance Meter using IC555
4. Flash ADC – IC Quad op-amp.
5. Instrumentation amplifier.

PART B : Project Work (30 marks)

Project work to be completed in four classes

Students in a group of TWO will assemble one Electronic Project. The faculty members will guide the students. Each student should write a brief report about the project including the components used and their specification, working of the circuit and applications and submit the same at the time of practical examinations duly certified by the concerned faculty and HOD

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UNIT	Hours	Marks	Part A (4)	Part B (10)
1	5	12	3	-
2	14	38	2	3
3	08	24	1	2
4	06	18	2	1
5	12	36	4	2
	Total= 45	Total= 128	12	08

Disclaimer: III year syllabus is subjected to the approval of Board of studies.

