St. Xavier's College (Autonomous), Ahmedabad-380009

B.Sc. Electronics Syllabus

Semester-1

CORE Paper: Basics of Electronics-1
Course Code: EL-1501
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Apply knowledge about different passive and active components used in electronic industry for common application, Design circuits using passive and active components for strengthening fundamental idea about basic electronics
2. Describe the basic construction of measuring instruments used in electronic measurements, Draw load line and find Q point for any circuit.
3. Analyse and find the voltage at any given time at the output of any clipper circuit, Design and analyse clipper circuits. Based on the understanding of clipper circuits the student will be able to interpret the working of the circuit and gauge its advantages and hence list its applications.
4. and analyse clamper circuits. Based on the understanding of clamper circuits the student will be able to interpret the working of the circuit and gauge its advantages and hence list its applications, Design and understand the working of various multiplier circuits
5. Analyses multiplier circuits and know its advantages, Differentiate between different types of diodes like Zener diode, Tunnel diode, Varactor diode, Photo diode, LED, LCD etc. based on their construction and working.
6. Design circuits using these of diodes based on their working and advantages, Understand the construction, working and advantages of Photo Voltaic Cells.
7. Describe characteristics of ideal and practical amplifier, demonstrate good understanding of calculating harmonic distortion,
8. Define ' dB' unit and apply for measuring gain of the amplifier, know the conversion of number from one number system to another.
9. Employ the knowledge of sign binary number in Binary arithmetic, learns different types of codes for the representation of information.
10. Know the error in transmission of the binary data and able to correct the data.

Course structure

UNIT 1

Passive Circuit element: Resistors, nonlinear resistors, inductors, types of inductors, capacitors, classification of capacitors, different type of capacitors. Switch, types of switches, fuses, circuit breaker, relay, PCB. Surface Mount Devices

Measuring Instrument: DC ammeters, DC voltmeters, Voltmeter sensitivity, series type ohmmeter, shunt type ohmmeter, multimeter, Rectifier type instruments (AC voltmeter), Typical multimeter circuit.

UNIT 2:

Diodes and their Applications: Load line analysis of a diode circuit, clipping circuit, positive and negative clipper, biased clipper clipper, some other biased clipper, combination clipper, two level slicer, clamping circuit, biased clampers, practical clamper circuits, application of clamping circuits, voltage multiplier, voltage doublers, voltage trippler and quadrupler.

Special purpose diodes: varactor diode, varactor diode specifications and applications, LED, LED voltage drop and current, LED applications, multicolor LEDs, LCDs, photodiodes, photoconductive cells, photo voltaic cells, LASER diodes and applications.

UNIT 3

General amplifier characteristics: Concept of amplification, amplifier notation, current, voltage and power gain, amplifier input resistance and output resistance, maximum power transfer, conversion efficiency, classes of amplifier, harmonic distortion , three point method of calculating distortion, Measurement of harmonic distortion, other type of amplifier distortion

Decibels, other equation for decibel computation, zero decibel reference level, use of a voltmeter as a decibel indicator, voltmeter range correction factor, frequency response, amplifier band width, phase relationship in amplifier, square wave testing

UNIT 4:

Number systems and codes: Introduction, number system, inter conversion of number, signed binary number, floating point representation of number, binary arithmetic, complement binary arithmetic, arithmetic overflow, codes (BCD, 2-4-2-1 code, 4-bit BCD and 5-bit BCD, Biquinary code, excess 3, gray code, 7-segment code, alpha numeric codes, error detecting, error correcting code, hamming code.

Text Books

1. Digital electronics By G. K. Kharate, Oxford University Press
2. Modern Electronics instrumentation and measurement techniques By Helfric and Cooper, PHI 11th Reprint
3. A Text Book of Applied Electronics By R S Sedha; S. Chand & Company.
4. Electronic Devices and Circuits by Allen Mottershead (Article: 2.1)
5. A text book of electronic circuits R. S. Sedha, S. Chand
6. Electronics devices and circuit By Allen Mottershead, PHI

Ref Books

1. Digital Design ByMoriss Mano, PHI
2. Digital Principles by Malvino and Leach McGraw Hill
3. Digital Fundamentals By Floyd , Pearson
4. Electronic Instrumentation by H. S. Kalsi TMH India
5. A monograph on Electronics Design Principle, By Goyal and Khetan,
6. Khanna Publisher
7. Basic Electronics (Solid State) by B. L. Theraja S. Chand & Co.
8. Electronic Devices and Circuit by Boylestead and Namensky
9. Electronic Principles by Malvino and Bates

St. Xavier's College (Autonomous), Ahmedabad-380009

B.Sc. Electronics Syllabus

Semester-1

CORE Paper: Electronics lab-1
Course Code: EL-1502L
No. of credits: 3
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Identify and test electronics active and passive components.
2. Convert galvanometer (Ammeter) into multirange DC and AC voltmeter.
3. Measure the Dielectric constant of a material.
4. Understand Voltage doubler circuit, Voltage multiplier circuit, half and full wave rectifier and zener as a voltage regulator.
5. Analyse characteristics of different coloured LED.
6. Design and analyse series resonance circuit.
7. Design and analyse wien bridge circuit.
8. Describe characteristics of common emitter amplifier.
9. Study of AND, OR, NOT and universal gates.
10. Study the load characteristics, internal resistance and ripple factor of rectifiers.

Course structure

GROUP A

1. Identification and testing of electronics active and passive components.
2. To familiarize with various laboratory instrument.
3. To design and test the multirange AC / DC voltmeter.
4. To determine dielectric constant of given material.
5. To study voltage doubler circuit.
6. To study voltage multiplier circuit.
7. I-V characteristics of different colored LED.

GROUP B

1. To study load characteristics, internal resistance and ripple factor of a Half wave rectifier
   (With and without 'C' filter).
2. To study load characteristics, internal resistance and ripple factor of a Full wave rectifier (With and without 'C' filter).
3. To study Zener diode as shunt voltage regulator.
4. To find resonance frequency, bandwidth and Q of a given series resonant circuit by varying frequency of ac source
5. To study Wien bridge as a frequency selective network.
6. CE Amplifier (load variation).
7. Study of AND, OR, NOT, NOR , NAND and Ex- OR gate using IC 7400.

Examination scheme: Total 100 Marks: Internal 30 marks; External 70 Marks
Student has to perform total two experiments during practical exam. From each group, student has to perform one experiment.
Marks for Section A: 35 Marks
Marks for Section B: 35 Marks
Total Time duration for practical exam: 4 hours
Practical batch size: Maximum 15 students

St. Xavier's College (Autonomous), Ahmedabad-380009

B.Sc. Electronics Syllabus

Semester-2

CORE Paper: Basics of Electronics-2
Course Code: EL-2501
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Understand different concepts of Resonance, i.e., series and parallel, apply concepts for the design of different types of frequency selecting network.
2. Understand different theorems for network analysis, i.e., Thevenin's, Norton's, Superposition and maximum power transfer, Analyze complicated circuits.
3. Define h parameters for two port networks, Draw and analysis the h parameter equivalent circuits for the three transistor configurations CE, CB, CC.
4. Draw and analysis Re equivalent circuits for the three transistor configurations CE, CB, CC, Compare CC, CE and CB with respect to Ri, Ro, Ai, Av
5. Describe and interpret Basic and Universal logic gates and combinational logic circuits, Describe and Design of logic circuits using SOP and POS methods.
6. At the end of the course, students will be able to: Interpret and simplify Boolean equations using Boolean laws and theorems and Karnaugh map, Design and implementation of Arithmetic and logic operations through digital circuits.
7. Take and interpret take characteristics of CE, CB and CC configuration of transistor.
8. Analyze transistor amplifier using h parameters, measure the h parameters of transistor amplifier.
9. Know the factor causes thermal instability of Bipolar transistor.
10. Design amplifier using BJT with different bias circuit.

Course structure

UNIT 1

Bipolar junction Transistor: Operation of NPN transistor, Operation of PNP transistor, CE configuration, Break down in Transistor, EBSER-MOLL model, Bias stability, Thermal run away, Stability factor, Method of Transistor Biasing, Fixed Bias method, Emitter feedback bias, collector to Base bias, collector emitter feedback bias, Voltage divider bias, Bias compensation, Thermistor and bias compensation

UNIT 2

Mid Band Analysis of small signal Amplifier: Two port devices and Network Parameters, Z, Y and h parameters, Hybrid model for two port network, Analysis of transistor amplifier circuits using h parameters, Simplified CE hybrid model, The 'r_e'modelof transistor, small signal analysis of single stage BJT amplifier, CE amplifier with unbypassed emitter resistance,CE amplifier with voltage divider bias, MILLER's theorem and its dual, Design of single stage RC coupled amplifier using BJT

UNIT 3

Network Theorem and Resonance Circuit: Reduction of complicated network, conversion between T and π sections, bridge T network, the lattice network, superposition theorem, the reciprocity theorem, Thevenin's theorem, Norton theorem, maximum power transfer theorem, compensation theorem.

Resonance: Definition of Q, the figure of merit, series resonance, Bandwidth of the series resonant circuit, parallel resonance or anti resonance, current in anti-resonant circuits, Bandwidth of anti-resonant

UNIT 4:

BOOLEAN ALGEBRA: Basic Laws of Boolean algebra, over view of logic circuit, DeMorgan's theorem, standard representation for Logical function, MINTERM and MAXTERM, Simplification of Boolean expression, Karnaugh Map simplification, simplification of SUM OF PRODUCT, Simplification of PODUCT OF SUM, Don't care condition, Quine-McCluskey method, Design procedure for combinational Logic circuit, Half Adder, Full adder, N bit parallel adder, Subtractor, N bit parallel subtractor

Text Books

1. Electronics Devices and Circuits By S Salivahanan, N Suresh kumar , McGrawHill
2. Electronic Devices and Circuit TheoryBy Robert Boylestad Louis Nashelsky,PHI
3. Digital Electronics By G K Kharate , OXFORD university Press
4. Network, Lines and Field by John D Ryder

Reference Books

1. Electronics Devices & circuits by A. Mottershead, PHI
2. Handbook of Electronics By Kumar and Gupta,PragatiPrakashan
3. Introductory Circuit Analysis by Robert Boylestad, 10^{th} Edition
4. Digital Design by Morissand Mano, PHI
5. Digital Principles by Malvino and Leach, McGraw Hill Publication
6. Electronics Devices & circuits by A. Mottershead, PHI

St. Xavier's College (Autonomous), Ahmedabad-380009

B.Sc. Electronics Syllabus

Semester-2

CORE Paper: Electronics Lab-2
Course Code: EL-2502L
No. of credits: 3
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Verify the Thevenin's and maximum power transfer theorems.
2. Convert a given network into T network and π network.
3. Design and analyse RC high pass and low pass filter circuits
4. Find resonance frequency, bandwidth and Q factor of a parallel resonance circuit.
5. Analyse I-V characteristics of a photo diode
6. Understand load characteristics and ripple factor of a Bridge rectifier.
7. Determine 'h' parameters of a transistor (CE configuration).
8. Understand frequency response and input and output resistance of CE amplifier.
9. Design and understand half and full adder and half and full subtractor using Ex OR and NAND gates.
10. Understand the conversion of binary to gray code and gray to binary code.

Course structure

GROUP A:

1. To verify the Thevenin's theorem
2. To verify the maximum transfer theorem
3. Conversion of a given network in to T- network and π- network
4. RC high pass filter
5. RC low pass filter
6. To find resonance frequency, bandwidth and Q of a given parallel resonant circuit by varying frequency of ac source
7. I-V characteristics of a photodiode

GROUP B:

8. To study load characteristics and ripple factor of a Bridge rectifier (with and without 'C' filter)
9. To determine 'h' parameters of a transistor (CE configuration)
10. Study of CE amplifier (frequency response , input and output resistance of amplifier)
11. Study of two, three and four input Ex-OR gate. Ex-OR gate as a parity checker and inverter.
12. Study of Half adder and full adder using Ex OR and NAND gates
13. Study of Half subtractor and full subtractor using Ex OR and NAND gates
14. To study the conversion of Binary to Gray code and Gray to Binary code

Examination scheme: Total 100 Marks: Internal 30 marks, External 70 Marks
Student has to perform total two experiments during practical exam. From each section student has to perform one experiment.
Marks for Section A: 35 Marks
Marks for Section B: 35 Marks
Total Time duration for practical exam: 4 hour
Practical batch size: Maximum 15 students

St. Xavier's College (Autonomous), Ahmedabad-380009

B.Sc. Electronics Syllabus

Semester-3

CORE Paper: Basic Analog Electronics-1
Course Code: EL-3501
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Design different types of the filter circuit used in power supply, Define and explain stability factor, temperature coefficient, load regulation and line regulation of the power supply.
2. Analyzes and designs different types of the voltage regulators used in the power supply, apply different types of feedback the amplifier to obtain the stability of the circuit.
3. Analyze the circuit by knowing its parameters like B_W, R_I, R_O, A_V, D_F and Design the different kind of oscillator circuits.
4. Know the advantages of FET over BJT, Demonstrate the application of FET as VVR and FET Diode.
5. Design an amplifier and switching device by using of MOSFET.
6. Design the AGC by using DUAL GATE MOSFET.
7. State and interpret the difference between Low frequency and High frequency response of an amplifier circuit and the reason for decrease in gain of an amplifier circuit when low or high frequencies are applied to it.
8. Analyze an amplifier circuit when low or high frequencies are applied to it and calculate the value of f1, f2 and the bandwidth of an amplifier circuit
9. Describe various types of cascaded amplifier circuits.
10. Design, analyze and test various types of cascaded amplifier circuits.

Course structure

UNIT –I

Frequency Response of Amplifiers: General shape of frequency response of amplifier, General frequency consideration, Low frequency response of transistor amplifier, Effect of Bypass capacitor on low frequency response, Effect of coupling capacitor on low frequency response, High frequency π model for a transistor, Hybrid π capacitance, CE short circuit current gain, β cut off frequency, α cut off frequency, High frequency current gain with resistive load

Multi stage Amplifiers: Different coupling scheme used in amplifier, Two stage RC coupled amplifier, Transformer coupled amplifier.

UNIT – II

Negative Feedback in transistor amplifier: General theory of feedback, reasons for negative feedback, loop gain, types of negative feedback in transistor circuits

Transistor Oscillators: Introduction, Effect of positive feedback, requirements for oscillations, the phase shift oscillator, Wien bridge oscillator, LC oscillators, Colpitt's and Hartley oscillators with analysis.

UNIT – III

Field Effect Transistor: Construction of N-channel JFET, Operation of N-channel JFET, characteristics parameters of the JFET, Expression for saturation drain current, Slope of transfer characteristic at I_{DSS}, Comparison of JFET and BJT.

Common source AC amplifier, Source follower, the common gate FET amplifier, Frequency response of FET Amplifier

MOSFET: The depletion MOSFET, The enhancement MOSFET, difference between JFET's and MOSFET's, handling precautions for MOSFETS, Dual gate MOSFETS, Integral gate protection, Testing field effect transistor, applications of FETS in its channel ohmic region, application of FET as a VVR in voltage control attenuator, The field effect diode

UNIT – IV

Filters: The capacitor filter, ripple factor, Approximate method, choke input LC filter, Ripple factor in LC filter, value of critical inductance, C-L-C filter.

Voltage Regulators: Voltage regulation, zener diode shunt regulator, working of zener diode shunt regulator, optimum value of current limiting resistor, disadvantage of zener diode shunt regulator, transistor shunt regulator, transistor series regulator, controlled transistor series regulator, short circuit protection against overload, transistor current regulator.

Text Books

1. Electronics Devices and Circuit (3rd edition) by S Salivahanan, Suresh kumar McGraw Hill Publication
2. Electronic Devices and circuits – An introduction by Allen Mottershead
3. Hand Book of Electronics by Gupta and Kumar, PragatiPrakashan
4. Electronics Devices and Circuit (3rd edition) by S Salivahanan, Suresh kumar
5. McGraw Hill Publication (Articles: 7.2 to 7.7)
6. Electronic Devices and circuits – An introduction by Allen Mottershead
7. Text book: Electronic Devices and circuits by Allen Mottershead
8. Text book: A Text Book of Electronic Circuits by R S Sedha, S. Chand & Co.

Reference Books

1. A monograph on Electronics Design, by Goyal&Khatan, Khanna publisher

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B.Sc. Electronics Syllabus

Semester-3

CORE Paper: Signals and digital electronics
Course Code: EL-3502
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Understand different concepts of impedance matching, i.e., L-section, T-section, image impedance and transformer
2. Further apply these concepts for the design of different types of impedance matching circuits.
3. Use a variety of analysis techniques to solve basic electrical systems, use appropriate circuit analysis techniques to analyze AC and sinusoidal systems
4. Apart from solving higher order differential equations, which are extensively used in mechanical and electrical engineering.
5. After studying Digital Electronics and Multiplexer / De-multiplexer circuits, students will have a thorough understanding of the fundamental concepts and techniques used in digital electronics and electronic switching circuits, which are used in telephone industry.
6. They will be able to understand Decoder and Encoder circuits used for communication (I/O device) with digital circuits, understand how operations are synchronized in Clock and timer circuits, examine the structure of various number systems and their application in digital design, ability to understand, analyze and design various combinational and sequential circuits.
7. Ability to identify basic requirements for a design application and propose a cost effective solution apart from developing skill to build, and troubleshoot digital circuits.
8. In the unit of Microprocessors, the students will be able to explain the overview of a microprocessor based system and also explain the functions of each component.
9. They will be able to explain the concept of machine language, assembly language and high-level languages, explain the microprocessor's architecture and its operation, explain memory organization and memory map.
10. How memory addresses are assigned to a memory chip, list the types of memory and their functions, define tri-state logic and explain the functions of various logic devices used for interfacing with microprocessor.

Course structure

UNIT – I

Impedance Transformation and Coupled Circuits: Transformation impedance with tapped resonant circuits, Reactance L sections for impedance transformation, Image impedance, reactance matching, Reactance T networks for impedance transformation, coupled circuits, mutual inductance, coefficient of coupling equivalent T network for magnetically coupled circuit, Iron-core transformer, the Ideal transformer, singly tuned air-core transformer, doubly tuned air core transformer.

UNIT – II

Network Analysis using Laplace Transformation: The Laplace transformations, inverse Laplace transformation, important theorems regarding Laplace transformation, application of Laplace transformation in analyzing simple networks, use of partial function expansion in analysis using Laplace transformation, Heaviside's partial function expansion theorem, response of series RL circuit to exponential driving voltage, response of series RC circuit to exponential driving voltage, response of series RLC circuit to exponential driving voltage, response of series RLC circuit to exponential driving current, response of series RL circuit to step sinusoidal voltage, response of series RC circuit to step sinusoidal voltage, response of series RLC circuit to step sinusoidal voltage.

UNIT – III

Data processing circuits: Multiplexers, Demultiplexers, 1-of-16 decoder, BCD-to-decimal decoders, seven segment decoders, encoders, Priority encoder, Exclusive-OR gate, parity generators and checkers, read only memory.

Clock and 555 Timer: Description of functional diagram, monostable operation, linear ramp generator, frequency divider, astable operation.
Clock waveforms, TTL clock, Schmitt Trigger, Monostables with input logic, Pulse Forming Circuit.

UNIT – IV

Microprocessor - I: Microprocessor, Instruction set and computer language,

Microprocessor Architecture and Microcomputer Systems: Microprocessor Architecture and its operations, Memory, Logic devices for interfacing.

Text Books:

1. Networks, Lines and Fields by J. D. Ryder (3.1 to 3.12)
2. Roy Chaudhuri, Del-Toro
3. Network Analysis By G K Mithal, Khanna Publishers
4. Digital Principles and applications 6th Edition Malvino Leach and Saha
5. Linear Integrated Circuits 4th Edition by Chaudhary and Jain, New Age International Publishers.
6. Microprocessor Architecture, programming and application with 8085, 5th Edition: Ramesh Gaonkar ,Penram Int. pub Pvt. Ltd.

Reference Books

1. Network Analysis M. E. Van Valkenberug
2. Digital Signal Processing S Salivahanan, AVAllavaraj, C Gnanapriya
3. Digital Fundamentals by Floyd, Pearson
4. Digital Design Morris and Mano PHI publication

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B.Sc. Electronics Syllabus

Semester-3

CORE Paper: Electronics Lab-3
Course Code: EL-3503L
No. of credits: 2.5
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Verify the Two stage RC coupled amplifier.
2. Study of voltage series negative feedback amplifier.
3. Study of current series feedback amplifier.
4. Study of collector amplifier with frequency response.
5. Analyse the common source FET amplifier.
6. Understand and study of clipping and clamping circuit using diode.
7. Understand the RC phase shift oscillator using transistor.
8. Study of Lissajous figures and measurements of phase difference using CRO.
9. Study of multiplexer and its application for designing combinational logic circuits.
10. Understand the 3-8 decoder using 74138 IC and its application for logic circuits.

Course structure

SECTION: A

1. Two stage RC coupled amplifier
2. Voltage series Negative feedback Amplifier (frequency response, i/p and o/p resistance of amplifier)
3. Current series feedback Amplifier (frequency response, i/p and o/p resistance of amplifier)
4. Common collector amplifier (frequency response, i/p and o/p resistance of amplifier)
5. Common source FET amplifier
6. Study of clipping and clamping circuit using diode
7. To design and construct the series voltage regulator
8. To design and construct electronics voltage regulator using error amplifier
9. To design and construct the constant current source using transistor

SECTION: B

1. RC phase shift oscillator using transistor
2. Wien Bridge oscillator using transistor
3. Study of Lissajous figures and measurement of phase difference using CRO
4. 4-bit adder- subtractor using IC 7483, 7486
5. Study of 8:1 multiplexer (74151) and and study of1:4 and 1:8 demultiplexer using IC 74155
6. study of 3:8 decoder and BCD to decimal decoder (74138 and 7475)
7. Study of decimal to BCD encoder (priority encoder 74147) and driving seven segment display using BCD to seven segment decoder IC (7447) (Display the number using both IC)
8. Design of logic circuit using Karnaugh map (SOP method)
9. Design of combinational logic circuit using multiplexer IC.
10. Design of combinational logic circuit using Decoder IC.

Examination scheme: Total 100 Marks: Internal 30 marks, External 70 Marks
Student has to perform total two experiments during practical exam. From each section student has to perform one experiment.
Marks for Section A: 35 Marks
Marks for Section B: 35 Marks
Total Time duration for practical exam: 6 hours
Practical batch size: Maximum 15 students

St. Xavier's College (Autonomous), Ahmedabad-380009

B.Sc. Electronics Syllabus

Semester-4

CORE Paper: Operational Amplifier
Course Code: EL-4501
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Describe the function of each component in transformer coupled Amplifier, class- A, B, and AB push pull power amplifier.
2. Will able to design the Transformer coupled amplifier, class- A, B, and AB push pull power amplifier.
3. Will described basic principles of complimentary push pull amplifier.
4. Will know the characteristics of OPAMP 741, will able to design the amplifier using OPAMP 741.
5. Will know the parameters contributing error in output of OPAMP and will able to reduce the error voltage in output using balancing technique.
6. Write down the evolution of ICs as merits over the conventional discrete circuits, learn techniques of fabrications of monolithic ICs and the measures to improve the fabrication methodology.
7. Enable to describe the fabricate active and passive components like: Diodes, Transistors, MOSFET, Resistors and Capacitors.
8. Describe the fundamental principles of wave shaping circuit.
9. Illustrate the working of High pass and Low pass filter circuit JT.
10. Describe different types of Multivibrators.

Course structure

UNIT – I

Class-A Power Amplifiers: Class-A direct coupled resistive load, Transformer Coupled Resistive Load, Design Theory, Power Amplifier Design, Harmonic Distortion , Power Output, Variation of Output power with load, Output Transformer Saturation, Disadvantages of a single ended transformer coupled amplifier, Push-pull Amplifier, Description of operation of class-A push-pull Amplifier, Theory of operation of class-A push-pull Amplifier.

Class-B Power Amplifier: The class-B push-pull Amplifier, Cross Over Distortion, Class-AB push-pull Amplifier, Transistor Phase Inverter, Conversion Efficiency of Class-B Amplifier, Relation between maximum output power and load, Relation between maximum output power and Transistor dissipation, Design of class-B push-pull amplifier, Other class-B push-pull amplifiers, Complementary Symmetry, Practical complementary symmetry amplifier.

UNIT – II

Operational Amplifier - I: Introduction, basic information of OPAMP, The ideal operational amplifier

Operational amplifier characteristics: D.C Characteristics: Input bias current, Input offset current, Input offset voltage, total output offset voltage, thermal drift, slew rate, analysis of data sheet.

UNIT – III

Fabrication of IC: Classification, IC Chip size and circuit complexity, fundamental of monolithic IC technology, basic planar processes, fabrication of a typical circuit, active and passive components of ICs, fabrication of FET, thin and thick film technology, technology trends.

UNIT – IV

Wave shaping circuit: High pass R C circuit (for sinusoidal and square wave i/p), High pass RC circuit as differentiator, Low pass R C circuit (for sinusoidal and square wave i/p), Low pass RC circuit as a integrator

Multivibrators: Collector coupled Astable multivibrator, Monostable muitivibrator, Bistable multivibrator, Schmitt trigger

Text Books

1. Electronic Devices and Circuit by Allen Mottershead
2. Linear Integrated Circuits by Roy Chaudhary and S. B. Jain New Age Int Publisher 4^{th} Edition.
3. Hand book of Electronics, Kumar and Gupta, PragatiPrakashan 35^{th} Edition.
4. Electronic Devices and circuit, S Salivahanan, N Suresh Kumar 3^{rd} Edition McGraw Hill Publication

Reference Books

1. Electronics Devices and Circuits by S. Shalivahanan, N.SureshKumar,TMH.
2. Integrated Circuit by Bodkar

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B.Sc. Electronics Syllabus

Semester-4

CORE Paper: Digital Electronics & Microprocessor
Course Code: EL-4502
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Describe and study of Fourier Integral and Fourier Transform.
2. Study the spectrum envelops for a recurring pulse and typical Fourier transform.
3. Explain the relationship of Fourier and Laplace transforms and application in network analysis.
4. Study of filters and the propagation constant and the properties of symmetrical networks.
5. Will be able to understand TTL and CMOS Logic Family with switching circuit.
6. Study the TTL parameters and CMOS characteristics with TTL to CMOS interface.
7. Understand the different types of Flip-flops with various representation of flip-flop and analysis of sequential circuits.
8. Study the Shift Registers with types of Registers and application of shift registers.
9. Understand the microprocessor 8085 with its communication and bus timings.
10. Study of 8085 microprocessor architecture, decoding and executing an instruction.

Course structure

UNIT – I

Fourier Integral and Fourier Transform: Spectrum envelop for a recurring pulse, Fourier integral and Fourier transform, a few typical Fourier transforms, the relationship of Fourier and Laplace transforms, application in network analysis, bandwidth and pulse duration

Filters: The neper, the decibel, characteristics impedance of symmetrical network, current and voltage ratio as exponentials, the propagation constant, properties of symmetrical networks, filter fundamentals, pass and stop bands, Behavior of the characteristic impedance, the constant K low pass filter, the constant K high pass filter, constant K band pass filter, constant K band elimination filter

UNIT – II

TTL and CMOS Logic Family: Switching circuit, 7400TTL, TTL parameters, TTL overview, OPEN collector gates, Three state TTL device, External drive for TTL loads, 74C00 CMOS, CMOS characteristics, TTL-TO-CMOS interface, CMOS-TO- TTL interface

UNIT – III

Flip - Flops: RS Flip-Flops, Gated Flip-Flops, Edge-triggered RS Flip-Flops, Edge-triggered JK Flip-Flops, Flip-Flop timing, JK master slave flip-flops, Various representation of flip-flops, Analysis of sequential circuits.

Shift Registers: Types of Registers, serial– in- serial out, serial in-parallel out, parallel in serial out, parallel in parallel out, Application of Shift Registers.

UNIT – IV

Microprocessor – II 8085 Microprocessor Architecture and memory Interfacing:
The 8085 MPU: The 8085 Microprocessor, Microprocessor communication and Bus timings, De multiplexing the Bus AD7-AD0, Generating Control Signals, A Detailed look at the8085 MPU and its Architecture, Decoding and Executing an Instruction

Example of an 8085 based microcomputer: Opcode Fetch Machine Cycle, Memory Read Machine Cycle, How to recognize Machine Cycle, Memory interfacing: Memory Structure and Its Requirements, Basic Concepts In Memory
Interfacing, Address Decoding, Interfacing Circuit, Address Decoding and Memory Addresses

Text Books

1. Network Analysis By G. K. Mithal Khanna Publishers
2. Digital Principles and Applications; 6th EditionBy Leach, Malvino and Saha,TMH
3. Microprocessor, Architecture, Programming and Application with the 8085, (5th Edition).
4. Ramesh Gaonkar, Penram International Publishing Private Limited
5. Networks, Lines and Fields by J. D. Ryder

Reference Books

1. Network Analysis M. E. Van Valkenberug
2. Digital Signal Processing S Salivahanan, AVAllavaraj, C Gnanapriya
3. Digital Fundamentals by Floyd, Pearson Publication
4. Digital Design Morris and Mano, PHI publication

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B.Sc. Electronics Syllabus

Semester-4

CORE Paper: Electronics Lab-4
Course Code: EL-4503L
No. of credits: 3
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Study of OPAMP parameters.
2. Understand of OPAMP as an inverting and non-inverting amplifier.
3. Study of OPAMP as voltage to current and current to voltage converter.
4. Study of constant k-type low pass and high pass filters.
5. Understand the Hartely and Colpitt's oscillator using transistor.
6. Study of Astable multivibrator using transistor and IC555.
7. Understand Bistable and Monostable multivibrator using transistor and IC555.
8. Study of RS, JK, D flip-flop using NOR, NAND gates.
9. Study of shift registers and Johnson counter using IC 7495.
10. Study of conversion of Flip-flop as RS to D, T and J-K flip flop.

Course structure

SECTION A

1. Study of OPAMP parameters
2. OPAMP as an inverting Amplifier
3. OPAMP as non inverting Amplifier
4. OPAMP as voltage to current
5. OPAMP as current to voltage converter
6.Constant K type low pass and high pass filters
7. Hartely oscillator using transistor
8. Colpitt's oscillator using transistor

SECTION B

1. Astable multivibrator using transistor
2. Astable multivibratorusing IC555
3. Bistable multivibrator using transistor
4. Monostable multivibrator using IC 555
5. (a)RS flip- flop using NOR and NAND gates (b)J-K, D and T Flip flop using IC.
6. Study of TTL characteristics
7. Study of shift registers and Johnson counter using IC 7495
8. Conversion of Flip Flop (RS flip flop to D,T and J-K flip flop)

Project work (only for internal assessment): To design and construct variable voltage regulated power supply or mobile charger using IC LM 317. Student has to prepare a test report and project report for the evaluation.

Examination scheme: Total 100 Marks: Internal 30 marks; External 70 Marks
Student has to perform total two experiments during practical exam. From each section student has to perform one experiment.

Marks for Section A: 35 Marks;
Marks for Section B: 35 Marks;
Time duration for practical exam: 6 hour;
Practical batch size: Maximum 15 students

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B.Sc. Electronics Syllabus

Semester-5

CORE Paper: OPAMP applications and Semiconductor Physics
Course Code: EL-5501
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Understand different concepts of Voltage references and Protection circuits for IC voltage and current regulators, Design positive, negative and dual voltage regulators using IC
2. Design different types of current regulators using IC, Describe the bonding forces in solids.
3. Explain the formation of energy band and classify metals, semiconductors and insulators, Investigate direct and indirect semiconductors.
4. Discuss variation of energy bands with alloy composition, Distinguish between electrons and holes.
5. Define effective mass, intrinsic material and extrinsic material, Apply Fermi- Dirac statistic to semiconductors.
6. Calculate the concentration of electrons and holes in a semiconductor, Explain temperature dependence of carrier concentration.
7. Analyse conductivity and electron mobility, Describe the effect of temperature and doping on mobility, Explain Hall effect, Hall coefficient, Hall voltage, Apply Hall effect to find the type, concentration and mobility of the majority carrier.
8. Know working of differential amplifier and its transfer characteristics, Calculate the CMRR of opamp to estimate the error voltage in the output for arbitrary input, Demonstrate the working of Emitter coupled differential amplifier, Design the circuit to improve constant current source circuits to reduce the error voltage.
9. Describe the working of Inverting, Non inverting and summing amplifier, Design adder and subtractor circuits using Summing amplifier.
10. Demonstrate the working of Emitter coupled differential amplifier, Describe the working of precision rectifier, Log amplifier and Anti log amplifier using OPAMP and know the use of Multiplier IC for a different types application like frequency doubling, squarer, divider and finding square root of a given number.

Course structure

UNIT –I

Operational Amplifier – II: Operational amplifier internal circuit, Differential amplifier, Transfer characteristics, Low frequency small signal analysis of Differential amplifier, circuit for improving CMRR, constant current source, input resistance

OPAMP Application –I: Scale changer, inverting and non inverting summing amplifier, subtractor.

UNIT – II

OPAMP Application –II: Instrumentation amplifier, AC amplifier, V to I and I to V converter, OPAMP circuit using diodes (HW rectifier, FW rectifier, clipper and clamper circuit), sample and Hold circuit, Log and antilog amplifier

UNIT - III

IC voltage regulator: Internal circuit arrangement, Zener reference regulation protection , error amp, series pass transistor,3 terminal positive voltage regulators,3 terminal negative voltage regulators, 3 and four terminaladjustable voltage regulators, 4 terminal positive voltage regulators, 4 terminal negative voltageregulators, dual non tracking voltage reg, dual tracking voltage regulator, precision multi terminal regulators

Positive regulators using IC 723 , fold back current limiting of positive regulators, using IC 723, negative voltage regulators using IC 723 ,electronic shut down of a positive regulators ,current regulators, open loop current regulators, constant current regulators using 3 terminal regulators, current regulators using IC 723

UNIT – IV

Semiconductor Physics:

Bonding forces and Energy Bands in solids: Bonding forces in solids, Energy Bands, Metals, Semiconductors and Insulators, Direct and Indirect Semiconductors, Variation of Energy bands with alloy composition.

Charge carriers in Semiconductors: Electrons and Holes, Effective mass, intrinsic material, extrinsic material, Electrons and Holes in Quantum wells.

Carrier Concentrations: The Fermi level, Electron hole concentration at Equilibrium, Temperature dependence of Carrier Concentration, Compensation and Space charge Neutrality

Drift of carriers in Electric and Magnetic fields: Conductivity and Mobility, Drift and Resistance, Effect of Temperature and doping on mobility, High field Effects, The Hall Effect, Invariance of the Fermi level at equilibrium

Text Books

1. Linear Integrated circuit 4th edition, By Roy Choudhury and Jain, New Age International
2. Linear Integrated circuit 4th edition, By Roy Choudhury and Jain, New Age International
3. Modern Power Electronics by P.C. Sen. 2nd Edition.
4. Solid State Electronics DevicesByBen G. Streetman Prentice Hall of India Private Limited

Reference Books

1. Electronic Devices and Circuits G N Garud and L C Jain Tata Mcgraw Hill Publishing Limited
2. Physics of Semiconductor Devices (4th Edition), S. M. Sze and Kwok. K. Ng., John Wiely& Co. (India)
3. Semiconductor Physics and Devices: Basic Principle (3rd Edition), Donald Neauman, Tata McGraw Hill.

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B.Sc. Electronics Syllabus

Semester-5

CORE Paper: Digital Design and Microprocessor
Course Code: EL-5502
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Understand the asynchronous counters, decoding gates and changing the counter modulus.
2. Will be able to understand the decade counters, counter design as a synthesis problem.
3. Understand the design of sequential circuits of model selection and state transition.
4. Will be able to understand Moore Model, Mealy Model and state transition diagram.
5. Study of Basic Interfacing concepts and peripheral with device selection and data transfer absolute.
6. Understand 8255A Programmable Peripheral Interface with DAC 0800 and DAC Interfacing.
7. Study of Data Transfer Operations and Logic, Arithmetic Operations with programming techniques.
8. Study the additional data transfer and 16-bit arithmetic instruction with logic operations.
9. Understand time delay using one register and time delay using a register pair with Hexadecimal counter.
10. Will be able to understand Modulo Ten Counter, generating pulse waveforms with advanced subroutine concepts.

Course structure

UNIT - I

Counters: Asynchronous Counters, Decoding Gates, Synchronous Counters, Changing the Counter Modulus, Decade Counters, counter design as a synthesis problem

Design of Sequential Circuit: Model Selection, State Transition Diagram: State Definitions: Moore Model, State Transition diagram: Moore
Model, State Definitions: Mealy Model, State Transition diagram, State Synthesis Table,Design Equations and Circuit Diagram Moore Model, Mealy Model

UNIT- II

Microprocessor III: Basic Interfacing Concepts, Peripheral I/O Instructions; I/O Execution; Device selection and Data Transfer Absolutev/s Partial Decoding; Input

Interfacing: Interfacing Output Displays, LED Displays for Binary Data; Seven Segment LED Display**,** Interfacing Input Devices, Data Input from DIP switches; Hardware; Interfacing Circuit; multipleports addresses**,** The 8255A Programmable Peripheral Interface, Block Diagram of the 8255A; Mode 0: Simple Input or Output Port
DAC Specifications; DAC 0800; DAC Interfacing.

UNIT-III

Microprocessor IV: Data Transfer Operations; Arithmetic Operations; Logic Operations Programing techniques: Looping, Counting and Indexing;
Additional data Transfer and 16-Bit Arithmetic Instructions; Arithmetic Operations related To Memory; Logic Operations: Rotate; Logic Operations: Compare

UNIT-IV

Microprocessor V: Time Delay Using One Register; Time Delay Using a Register pair; Time Delay Using a Loop Within a Loop Technique; Counter Design with Time Delay; Hexadecimal Counter; Modulo Ten Counter; Generating Pulse Waveforms.
Stack; Subroutine; Restart, Conditional Call and Return Instructions; Advanced Subroutine Concepts.

Text Books

1. Digital Principles and Applications 6th editionby Donald P. Leach, Albert Paul Malvino and Gautam Saha Publisher: McGraw-Hill Companies
2. Microprocessor Architecture, Programming and Applications with8085 5th edition by Ramesh Gaonkar
3. 8 Bit Microprocessor—V.J. Vibhute and P.B. Borole

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B.Sc. Electronics Syllabus

Semester-5

CORE Paper: Electronic Instrumentation and Transducer
Course Code: EL-5503
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Understands the importance of the electronics voltmeter and digital voltmeter, Discuss the different circuit of electronics voltmeter.
2. Learn the techniques for measuring AC voltage and true rms voltage, Gets information about chopper type voltmeter and differential volt meter.
3. Learns the basic principle of the different types of the digital voltmeter, learn ramp typ, dual slope type, integrating type and successive approximation type DVM.
4. Understands the importance of the electronics Digital Meters, Digital Measurements of Time, Digitally Phase Measurement.
5. Discuss the different Type of CRO, its application and through it how to measure frequency and phase, it is very useful in Laboratory in almost all type of electronics lab.
6. Understands the importance of the Signal Generator, Discuss the different Type of Signal Generator and their applications
7. Understands the importance of the Signal Analyzer, Understands the application and measurements through Wave Analyzer, Different types of wave analyzer
8. Understand different concepts of Transducers, including those for measurement of temperature, strain, motion, position and light.
9. Choose proper transducer to make sensitive measurements of physical parameters like pressure, flow, displacement, velocity, temperature etc.
10. Locate different types of transducers and sensors used in real life applications.

Course structure

UNIT-I

Electronics meter: Transistor voltmeter, Chopper type DC amplifier voltmeter, solid state voltmeter, AC voltmeter using rectifier, AC voltmeter using half wave and full wave rectifier, average responding voltmeter, peak responding voltmeter, True RMS voltmeter

Digital voltmeter: Introduction, Ramp technique, Dual slope integrating type DVM, Integrating type DVM, Successive approximation type DVM, Resolution and sensitivity of Digital meters

UNIT-II

Digital Instruments: Digital frequency meter, Digital measurement of time, Digital tachometer, Digital phase meter, Digital capacitance meter

Cathode Ray Oscilloscope: Basic principle, CRT feature, Basic principle of signal display, Block diagram of oscilloscope, Simple CRO, vertical amplifier, Horizontal deflection system, Triggered sweep CRO, Delayline in trigger sweep, Typical CRT connection, Dual trace oscilloscope, Measurement of frequency by Lissajous method, use of Lissajous figures for phase measurement

UNIT-III

Signal Generators: Introduction, fixed frequency oscillator, variable oscillator, Basic standard signal generator, standard signal generator, Modern laboratory signal generator, AF sine and square wave generator, function generator, square and pulse generator,sweep generator

Wave Analyser and Harmonic Distortion: Basic wave analyser, frequency selective analyser,Heterodyne wave analyser, spectrum analyser

UNIT-IV

Transducers: Electrical transducer, selecting a transducer, resistive transducer, strain gauges, resistance thermometer, thermistor, inductive transducer, linear variable differential transducer, capacitive transducer, piezo electric transducer, photoelectric transducer, photo voltaic cell, semiconductor photo diode, photo transistor, thermoelectric transducer.

Text Books

1. Electronics Instrumentation by H S Kalsi, TMH edition
2. Electronics Instrumentation by H S Kalsi, TMH edition
3. Electronics Instrumentation by H S Kalsi, TMH edition
4. Electronics Instrumentation by H S Kalsi, TMH edition

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B.Sc. Electronics Syllabus

Semester-5

CORE Paper: Electronic Communication and Optical fiber
Course Code: EL-5504
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Define and explain modulation process and types of the modulation.
2. Analyze the Amplitude modulation through numerical.
3. Summarized and differentiate the different technique like DSBSC, SSB and VSB used in AM.
4. Describe and define the terminology like deviation of frequency, modulation index etc. used in FM.
5. Analyze the circuit for generation of FM wave. Student can also able to explain the working of the different types of the FM detector.
6. Will be able to develop good understanding of Noise, types of noise and signal to noise ratio.
7. Will be able to state the concept of fixed satellite service. Will also be able to understand satellite communication system and types of antenna used for satellite communication.
8. Will be able to understand the propagation of light in the optical fibers
9. Understand the factors causing the Attenuation of the signal propagating in the fiber and calculate the maximum bit rate
10. Will be able to compare the different sources and detectors used in the fiber optic communication system

Course structure

UNIT – I

Amplitude modulation: Elements of analog communication, Amplitude modulation technique, Time domain represation of AM wave, power relation in AM wave, current relation in AM wave, modulation by several sine wave, Double sideband suppressed technique, single sideband technique, vestigial sideband modulation technique, Generation of AM signal

UNIT – II

Angle modulation: Frequency modulation, phase modulation, comparison of frequency and phase modulation, frequency spectrum of FM wave, Narrow band and Wideband FM, comparision of FM and AM wave, Generation of FM, Direct methods Basic FM demodulators, slope detection, Balanced slope detector, phase discriminator, ratio detector

UNIT- III

Fiber-optic communication: Principle of light transmission in a fiber, fiber index profile, Losses in fiber, Rayleigh scattering losses, Absorption losses, bending losses, Dispersion, Effect of dispersion on pulse transmission, inter modal dispersion, material dispersion, Light sources for fiber optics, Light emitting diode, semiconductor LASER, Photo detectors, pn photodiode, pin photodiode, Avalanche photodiode, connector and splices, Fiber communication link

UNIT IV:

Noise: External noise, internal noise, Thermal agitation noise, shot nose, transit time noise, noise calculation, Addition of noise due to several sources, noise figure, signal to noise ratio, definition of noise figure, calculation of noise figure, noise temperature

Satellite communication: Satellite system, fixed satellite service, satellite communication Earth station, Antenna for satellite communication, advantages of cassegrain antenna, Antenna feed, Antenna structure

Text Books

1. Kennedy's Electronic communication systems by Kennedy, Davis &Prasanna(5thed)
2. Electronics and Radio Engineering

Reference Books

1. Reference Book: Electronics communication By Roddy and Coolen, 4th edition

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B.Sc. Electronics Syllabus

Semester-5

CORE Paper: Electronics Lab-5
Course Code: EL-5505L
No. of credits: 5
Learning Hours: 180

Course Objectives

At the end of the course student will be able to

1. Study of OPAMP as summing amplifier.
2. Understand of OPAMP as a current amplifier.
3. Study of OPAMP as a integrator and differentiator.
4. Study of active filter using OPAMP as first order high-pass and low-pass filter.
5. Understand of complimentary pair push-pull power amplifier.
6. Study of Wein Bridge and RC Phase Shift Oscillator using OPAMP
7. Understand of voltage and current regulator using IC 7805, IC 7905 and IC LM317.
8. Study and simulation of cicuits using Multisim software and preparation of the report.
9. Study and understanding of microprocessor programming in detail.
10. Analyse and minor project based on analog and digital electronics as it is to be designed and demonstrate the idea which will be encourage.

Course structure

Section – A

1. OPAMP as a summing amplifier
2. OPAMP as a current amplifier
3. OPAMP as a integrator and Differentiator
4. Active filter using OPAMP (First order High pass and Low Pass filter)
5. Complimentary pair Push - Pull power amplifier
6. Study of Amplitude modulator

Section – B

1. Wien Bridge oscillator using OPAMP
2. RC phase shift oscillator using OPAMP
3. Voltage regulator using IC 7805 and IC 7905
4. Current regulator using IC LM 317
5. Study of Solar cell
6. Study of Hall IC

Section – C

1. Monostable multivibrator using IC 74121
2. Asynchronous and synchronous counter using IC
3. Schmitt trigger circuit using transistor/OPAMP
4. Microprocessor Programming –I
5. Microprocessor Programming –II
6. Microprocessor Programming –III

Section – D

Minor project based on analog and digital electronics:
(Water level controller, cell phone charger, power amplifier, event counter, Burglar alarm, Metal detector, distance measurement etc.)

Student has to design, assembled and test the circuit of the project. The project should be in working condition. Student has to prepare and submit the project report. The innovative idea for the project will be encourage.

Simulation base experiment

For the internal evaluation, student has to simulate the following circuits using **NI multisim** software and prepare the report file. (10 marks)

1. High pass and Low pass passive filter
2. RC coupled amplifier
3. Positive and negative clipping circuit using OPAMP
4. Positive and negative clamping circuit using OPAMP
5. Astable multivibrator using OPAMP
6. Active filter using OPAMP (second order HP filter and LP filter)

7. Binary counter and Decade counter
8. Wien bridge oscillator using OPAMP
9. Half wave and full wave rectifier using OPAMP
10. VCO using 555 timer

Examination scheme: Total 200 Marks
Total Time duration for practical exam: 12 hours
Practical batch size: Maximum 10 students
External marks – 140marks

Marks for section A: 35 marks
Marks for section B: 35 marks
Marks for section C: 35 marks
Marks for section D: Demonstration of a project, project report & project viva - 35 marks

Internal marks – 60marks

Marks for internal practical exam: 3o marks
Marks for simulation-based experiments: 10 marks
Marks for presentation/seminar/ quiz based on experiments: 10 marks
Marks for journal or practical's report file: 05 marks
Marks for attendance: 05 marks

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B.Sc. Electronics Syllabus

Semester-5

CORE Paper: Introduction to Single Boards Computers with Python/C++
Course Code: EL-5401 (Elective)

Course Objectives

At the end of the course student will be able to

1. Have a working knowledge of python and electronics componentsWill be trained in numerical interpretation, graphical interpretation with Langrange's interpolation.
2. Understand python programming languageUnderstand Weddle rule, Monte Carlo method and Numerical double integration.
3. Understand the concept of IOT, Robotics and OpenCV
4. Understand the use of SBC's and python in field of physics

Course Structure

Unit 1: (12 lectures)

Introduction to programming with Python and C/C++
Introduction to basics of python, Data types, Operators, Arrays, Plotting, File I/O, Functions and Loops, Numerical Computing formalism

Unit 2: (12 lectures)

Sense and display real world problems,
Using python for automation and productivity, Sensor selection, Application designing, Use of SBC's and python in field of physics, Introduction to IOT, Introduction to Robotics, Introduction to OpenCV, Creating Projects with SBC's and Python/C/C++.

Unit 3: (12 lectures)

Introduction to SBC's, Introduction to Raspberry pi, Introduction to Arduino, Setting up Raspberry pi, Raspbian OS, raspi-config tool, Terminal, Remote Access, Difference between R-pi and arduino

References

1. Guy Hart-Davis (auth.)-Deploying Raspberry Pi in the Classroom-Apress (2017)
2. Karvinen K., Karvinen T.-Getting Started with Sensors_ Measure the World with Electronics, Arduino, and Raspberry Pi
3. Monk S.-Programming the Raspberry Pi_ Getting Started with Python

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B.Sc. Electronics Syllabus

Semester-6

CORE Paper: OPAMP Application and Power Electronics
Course Code: EL-6501
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Understand of Differentiator, Integrator and electronic analog computation.
2. Will be able to understand about comparator and its application with Schmitt trigger.
3. Will be able to understand the square wave generator and triangle wave generator.
4. Understand of Phase Locked Loop with its basic principles and phase detector and comparators.
5. Will be able to define voltage-controlled oscillator and low pass filter with monolithic phase locked loop.
6. Understand the PLL applications with frequency multiplication/division with frequency translation.
7. Will be able to understand the AM detection, FM demodulation and FSK demodulator.
8. Will be able to understand the switching regulators with minimum load and critical inductance and determination of filter inductance.
9. Understanding and describing the determination of filter capacitor with input and output power and its losses and efficiency.
10. Understanding the basics of Thyristor with SCR and its working and applications, TRIAC and its construction and applications.

Course structure

UNIT- I:

OPAMP Application- III: Multiplier and divider, Differentiator, Integrator, electronics analog computation, comparator, Application of comparator

UNIT-II:

OPAMP Application IV: Schmitt trigger, square wave generator, triangle wave generator

Phase Locked Loop: Introduction, Basic principles, Phase Detector and comparator, voltage-controlled oscillator (VCO), low pass filter, monolithic phase locked loop, PLL applications, frequency Multiplication/division, frequency translation, AM detection, FM demodulation, FSK demodulator

UNIT -III

Switching Regulators: Introduction, circuit scheme, Basic switching regulator, minimum load and critical inductance, Determination of filter inductance, determination of filter capacitor, input and output power, losses and efficiency (only definition), Design consideration of Buck switching regulator, control circuit consideration in buck switching regulator, Boost switching regolator, selection of inductor, selection of filter capacitor, transistor rating, control Boost regulator

UNIT – IV

Thyristor: SCR, Working of SCR, equivalent circuit of SCR, Important terms, V-I characteristics of SCR,SCR in normal operation, SCR as a switch, SCR switching , SCR H.W. rectifier, SCR F.W. rectifier

TRIAC: TRIAC construction, TRIAC operation, TRIAC characteristic, TRIAC phase controlled circuit, the DIAC, Application of DIAC , UJT, characteristics of UJT,UJT as relaxation oscillator.

Text Books

1. Linear Integrated circuit 4th edition, By Roy Choudhury and Jain, New Age International
2. Modern Power Electronics By P C Sen, S Chand & company
3. Principles of electronics by V.K Mehta 10th Edition S Chand & Co.

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B.Sc. Electronics Syllabus

Semester-6

CORE Paper: Introduction to Microcontroller
Course Code: EL-6502
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Understand of D/A Conversion and A/D Conversion with its application.
2. Will be able to understand variable resistor network and D/A converter testing with available D/A converters.
3. Will be able to describe the D/A Accuracy and Resolution with A/D simultaneous conversion and the ADC 0804 with Dual-Slope A/D Converter.
4. Understand of microcontroller and microprocessor with 8-bit and 16-bit microcontroller.
5. Will be able to define the CISC and RISC processor and commercial microcontroller devices.
6. Understand of basic MCS-8051 architecture, registers and pin description in detail.
7. Will be able to understand the 8051 connections with parallel I/O ports and memory organization.
8. Will be able to define 8051 addressing mode with MCS-51 instruction set and simple programs using stack pointer.
9. Understanding and describing the interrupts in MCS-51 with timers, counters and serial communication.
10. Understanding the application of MCS-51 as square wave generation, pulse generation, pulse width measurements and frequency counter.

Course structure

UNIT - I

D/A Conversion and A/D Conversions: Variable Resistor Network: Binary Equivalent Weight, Resistive Divider, Binary ladders,

D/A Converters: Multiple Signals, D/A Converter Testing, Available D/A Converters, D/A Accuracy and Resolution, A/D Converters-Simultaneous Conversion, A/D Converter-Counter Method, Continuous A/D Conversion, A/D Techniques: Successive Approximation, The ADC 0804, Section Counter, Dual-Slope A/D Conversion: Single Ramp A/D Converter, Dual-Slope A/D Converter, A/D Accuracy and Resolution

UNIT –II

Microprocessor – VI: Digital to Analog Converters (DAC) 0808
DAC Specifications, Standard DAC Chips: DAC 0808, DAC Interfacing, DAC Applications.

BCD Arithmetic and 16-Bit Data Operations: BCD Addition, BCD Subtraction, Introduction to Advanced Instructions and Applications, Multiplication.

Interrupts: The 8085 Interrupt, 8085 Vectored Interrupts.

UNIT – III

Microcontroller-I: 8051 Microcontrollers-Introduction, MCS-51 Architecture, Registers in MCS-51. 8051 Pin Description, Connections, I/O Ports and Memory Organization- 8051 Pin Description, 8051 Connections, 8051 Parallel I/O Ports, Memory Operations.

UNIT- IV

Microcontroller-II: 8051 Assembly Language Programming – Inside the 8051, Introduction to 8051 Assembly Programming, Assembling and running an 8051 program, The Program Counter and ROM Space in the 8051, 8051 Data Types and Directives, 8051 Flag Bits and the PSW Register, 8051 Register Banks and Stack.
Jump, Loop and Call Instructions – Loop and Jump Instructions, Call Instructions, Time Delay for Various 8051 Chips.

Text Books

1. Digital Principles and Applications 6th editionby Donald P. Leach, Albert Paul Malvino and GautamSaha Publisher: McGraw-Hill Companies
2. 8 Bit Microprocessor – Late V. J. Vibhute, P. B. Borole. **Publisher:** Tech-Max Publications.
3. Microprocessor Architecture, Programming and Applications with the 8085 – 6th Edition by Ramesh Gaonkar.
4. Microcontrollers (Theory and Applications) By Ajay V Deshmukh. **Publisher:** McGraw- Hill Companies.
5. The 8051 Microcontroller and Embedded Systems Using Assembly and C – 2nd Edition by Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay.

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B.Sc. Electronics Syllabus

Semester-6

CORE Paper: Electronic Communication and Cell Phone Technology
Course Code: EL-6503
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Describe the principle and block diagram of super heterodyne radio receiver.
2. Explain the circuit of radio receiver.
3. Define and explain the different parameters of the receiver.
4. Describe the working of the TV camera.
5. Explain the different block of the TV receiver.
6. discuss the fundamental principles of wave shaping circuit.
7. Illustrate the working of Highpass and Low pass filter circuitJT.
8. Explained different types of Multivibrators.
9. The working function of advanced phone system (1G) and further 2G, 2.5G. 3G and
10. The various communication techniques in different generation as a part of up gradation.

Course structure

UNIT- I

Radio Receiver: Receiver types, Tuned Radio frequency receiver, super heterodyne receiver, AM receivers, RF section and characteristics, Frequency changing and tracking, Intermediate frequency and IF amplifier, Detection and automatic gain control

UNIT – II

Television: Introduction, General principle of image transmission, Mechanism for image pickup, characteristics of image signal, Basic characteristics of Television system, Television camera, Camera tube requirement, Television broad cast channel, Kinescope, Scanning, progressive scanning, Interlaced scanning, method of obtaing scanning, the synchronizing pulses, composite video signal, TV standards CCIR- B, Transmission of Television signal, Resolution and bandwidth in TV system, Television receiver circuit

UNIT –III

Pulse Modulation Technique: Pulse amplitude modulation, pulse width modulation, pulse position modulation, pulse code modulation, Delta modulation, Differential code modulation, Demodulation of pulse digital modulated signal

Digital Modulation Technique: Amplitude shift keying, Frequency shift keying, Phase shift keying

UNIT – IV

Cell phone Technology: Cellular telephone system, cellular concept, frequency allocation, multiple access, The advanced mobile phone system, typical AMPS hand set, Digital cell phone system, 2G cell phone system, Digital cell phone circuit, 2.5G cell phone system, 3G cell phone system, 4G systems, Advanced cell phone, Base station

Text Books

1. Kennedy's Electronic communication systems by Kennedy, Davis &Prasanna(5thed)
2. Electronics and Radio Engineering By M L Gupta
3. Principle of Electronics System By Louis Frenzel 3rd edition TMH

Reference books

1. Electronics communication By Roddy and Coolen, 4th edition

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B.Sc. Electronics Syllabus

Semester-6

CORE Paper: Electrodynamics and DSP
Course Code: EL-6504
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Solve problems in electrostatic using Laplace equation
2. Describe hysteresis phenomena in ferromagnetic substances
3. Understand the concept of dipole radiation and its application to design and optimize the antenna properties.
4. Describe the concept of electromagnetic waves radiation for electric and magnetic dipole moment.
5. Understand the relativity concepts of electrodynamics, and discussion of Lienard Wiechert potential.
6. Understand and analyse the electrical quadruple and amount of total power radiation transmitted for different cases like arbitrary source and point charges.
7. To analyze the fundamentals of antenna theory and define various antenna parameters, describe the different types of antennas and their radiation mechanism
8. Identify the atmospheric and terrestrial effects on radio wave propagation, Describe the ground wave, space wave and sky wave propagation of radio waves
9. Explain the phenomenon of Digital Signal Processing, its advantages and disadvantages. Describe different types of signals, systems and classify them, explain various type of singularities and their applications and also explain simple manipulations of systems.
10. State and describe Z transform, Inverse Z transform, ROC and various properties of Z transform, perform Z transform on various signals and explain applications of Z transform

Course structure

UNIT- I

Electrodynamics-I: Boundary value problems in electrostatic field, poison and laplace equation, boundary condition and uniqueness theorem, solution of laplace equation in rectangular coordinates, hysteresis,

Maxwell equation, potential of electromagnetic field, plane waves in non-conducting media , polarization, energy flux in a plane wave, radiation pressure and momentum.

UNIT– II

Electrodynamics- II

Electromagnetic Radiation: Retarded Potential, Radiation from an oscillating dipole, Linear Antenna, Lienaed-Wiechert Potentials, Potentials for a charge in uniform motion – Lorentz formula, Fields of an accelerated charge, Radiation from an acceleration charged particle at low velocity, Radiation when the velocity and acceleration of the particles are collinear, Radiation from a charged particle moving in a circular orbit, Elective quadrupole radiation.

UNIT – III

Radiation and propagation of waves: Electromagnetic radiation, fundamental of electromagnetic waves, wave propagation, Ground waves, sky waves, space waves

Antenna: Basic consideration, electromagnetic radiation, the elementary doublet, current and voltage distribution, resonant antenna, radiation pattern and length calculation, Terms and definition, Antenna gain and effective radiator power, radiation measurement and field intensity, antenna resistance, Band width, beam width and polarization, Dipole arrays, Folded dipole and application, Loop antenna

UNIT-IV

Digital Signal processing: Classification of signal and systems,introduction, classification of signal, singularity functions, amplitude and phase spectra , classification of system , simple manipulation of discrete time signal,representation of system.

Z-transform: introduction -definition of Z transform, Definition of inverse z transform, region of conversion, properties of Z–transforms, linearity, time reversal, time shifting , differentiation, correlation,initial value theorems ,final value theorem, time delay, time advance , evaluation ofinverse Z- transform , long division method.

Text Books

1. Electromagnetism by B.B. laud. by new age international publishers. 3rd Edition.
2. Kennedy's Electronic communication systems by Kennedy, Davis &Prasanna(5thed)
3. Digital signal processing By S. Salivahanan.

Reference Books

1. Introduction to Electrodynamics By Griffith
2. Electronics and Radio Engineering By M L Gupta, DhanpatRai& sons

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B.Sc. Electronics Syllabus

Semester-6

CORE Paper: Electronics Lab-6
Course Code: EL-6505L
No. of credits: 5
Learning Hours: 180

Course Objectives

At the end of the course student will be able to

1. Study of OPAMP as comparator.
2. Understand of OPAMP as a log and antilog amplifier.
3. Study of OPAMP as a voltage regulator.
4. Study of D/A converter using OPAMP with R-2R ladder and Weighted resistor network.
5. Understand of Voltage to frequency and frequency to voltage converter using OPAMP.
6. Study of DC and AC characteristics of thyristors.
7. Understand of voltage sweep generator using UJT and measurement of acceptance angle of an optical fiber.
8. Will be able to understand and demonstrate the LVDT transducer and strain gauge transducer.
9. Study and understanding of DAC 0808 and ADC 0801 IC.
10. Analyse and project on chip design of digital circuit using Hardware Description Language (Verilog Code) and make a report on it.

Course structure

Section – A

1. OPAMP as a comparator
2. OPAMP as a log amplifier and antilog amplifier
3. OPAMP as a voltage regulator
4. Study of D/A convertor using OPAMP (R-2R ladder and weighted resistor network)
5. Study of A/D convertor using OPAMP

Section – B

1. DC characteristics of DIAC and SCR
2. DC characteristics of TRIAC
3. AC characteristics of SCR
4. AC characteristics of TRIAC
5. Voltage sweep generator using UJT

Section – C

1. To measure threshold current of a LASER diode
2. Study of a LVDT transducer
3. Fourier analysis of square wave using resonance circuit
4. Characteristics of a Varactor/Varicap diode
5. Study of ultrasonic/SONAR sensor for measurement of distance
6. Study of phase locked loop using IC 565

Section – D

1. Study of DAC 0808and ADC 0801 chip
2. Design of odd/even binary/Decade counter
3. study of 2 x 16 LCD display
4. Microprocessor Hardware interfacing experiment Using 8255
5. Microprocessor Hardware interfacing experiment Using DAC 0808
(Square wave and Triangular wave generation)
6. Microcontroller programming I
7. Microcontroller programming II

Experiments on Chip Design:

For internal evaluation student has to design and implement the following Digital circuit using Hardware Descriptive Language (Verilog **code**) on FPGA kit. Prepare a report file for the following example. (10 marks)
1. Design of a Ex- OR gate
2. Design of a 4:1 multiplexer
3. Design of a 1:4 demultiplexer

4. Design of a half adder and full adder
5. Design of a 4-bit full adder
6. Design a modulo – 8 up/down counter
7. Design of Arithmetic Logic Unit (ALU)

Examination scheme: Total 200 Marks
Total Time duration for practical exam: 12 hours
Practical batch size: Maximum 10 students
External marks – 140marks

Marks for section A: 35 marks
Marks for section B: 35 marks
Marks for section C: 35 marks
Marks for section D: 35 marks

Internal marks – 60marks

Marks for internal exam: 3o marks
Marks for report file of designing of chips using Verilog code: 10 marks
Marks for presentation/seminar/ quiz based on experiments: 10 marks
Marks for journal or practical's report file: 05 marks
Marks for attendance: 05 marks

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B.Sc. Electronics Syllabus

Semester-6

CORE Paper: Elective (Project)
Course Code: EL-6401
No. of credits: 4
Learning Hours: 60

Course Objectives

At the end of the course student will be able to

1. Will be trained in identifying Projects by doing literature survey in forms of Research papers, journals and looking for ideas in internet. He is also encouraged to come with original ideas which explain the concepts of Physics and electronics.
2. Will be trained in having "Hands on experience" with designing projects using various instruments, collecting data and in its analyses.
3. Will be able to document his project by writing synopsis and project report
4. Will be able to present his work in the form of PPT and in the process develops presentation skills.

Course structure

Major Project:

Major project based on analog or digital electronics or Microcontroller (Arduino)
Student has to design, assembled and test the circuit of the project. The project should be in working condition. Student has to prepare and submit the project report. The innovative idea for the project will be encouraged.