SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y.B.Sc. Electronic Science
Revised Syllabus

To be implemented from June 2015

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1) Title of the course: Third Year B.Sc. Electronic Science

2) Introduction:

Semester Pattern is followed at S.Y.B.Sc. Electronic Science. Third year B.Sc. syllabus is designed to provide an insight into applications of various circuit blocks , design analog and digital systems, methods to analyze working of systems and some of consumer products. Training on system design and simulations, learning programming languages like "C" and tools like "MATLAB" is included. A course in Project work is maintained in new syllabus and a guideline for it is framed.

In the theory courses adequate knowledge of Analog systems design, digital system design, communication systems, basics of nanotechnology, nanoelectronics will be acquired by the students.

Student taking admission at T.Y.B.Sc. Electronic Science have to complete 12 theory courses six each semester, two practical courses (Annual) and one project course (Practical III, Annual). In the practical course of 100 marks there are compulsory experiments along with the one activity to be done for practical course I and II. The details are mentioned in the syllabus.

3) Aim and Objectives:

The aim of the course is to generate trained manpower with adequate theoretical and practical knowledge of the various facets of electronic circuits and systems. Due care is taken to inculcate conceptual understanding in basic phenomena, materials, devices, circuits and products and development of appropriate practical skills suitable for industrial needs. Following are the
objectives -

i. To design the syllabus with specific focus on key Learning Areas.
ii. To equip student with necessary fundamental concepts and knowledge base.
iii. To develop specific practical skills.
iv. To impart training on circuit design, analysis , building and testing.
v. To prepare students for demonstrating the acquired knowledge.
vi. To encourage student to develop skills for accepting challenges of upcoming technological advancements.

4) Eligibility: Second Year B.Sc. Pass / ATKT , with all subjects cleared at F.Y.B.Sc.

5) Examination -

A) Pattern of Examination :

i) Semester III

Theory Papers - Six Theory papers of 50 marks per semester
(Internal examination 10 + Semester Examination 40, Total 50)

ii) Semester IV

Theory Papers - Six Theory papers of 50 marks per semester
(Internal examination 10 + Semester Examination 40, Total 50)

Practical - Three Practical courses, out of which Course III is Project work.

iii) Pattern of the question Paper:

The pattern adopted for theory and practical examination is as below.

Theory:

The topic wise weightage is decided as per lecture allotted to cover the syllabus for the topics. The Internal option is also taken into consideration in the process. Equal weightage is given for each topic. No topic can be given as optional.

Internal Examination 10 Marks

It is a continuous evaluation process and is executed by the teacher conducting the course.

Four types of questions -

Objective, Fill in the blanks, True or False and One Sentence Answer.

There are two or three different sets of the question papers used for internal examination in the same class for same paper.

External Examination 40 Marks

Pattern is as follows-

Q.1 Answer all of the following : 12 marks

Compulsory no internal option, contains one mark , two mark objective and numerical questions.

Q.2 Answer any TWO. : 08 marks

Three questions are given, each having 4 marks, any two are to be solved.

Q.3 Answer any TWO. : 08 marks

Three questions are given, each having 4 marks, any two are to be solved.

Q.4 Answer any TWO. : 12 marks

Three questions are given, each having 6 marks, any two are to be solved.

There is complete option question for Q.4 having three compulsory numerical Problems having weightage of 4 marks each.

Practical :

Internal Marks 20 :

Continuous assessment

External Examination 80 Marks.

Have to perform 2 experiments of 40 marks of the duration 3 hours each.

(Practical Examination is scheduled in two sessions.)

B) Standard of passing:

Candidate must score 40% marks at the semester examination in each course**. i.e. 16 marks at semester theory paper and 32 marks at the practical course**. There is no separate passing for internal course, however the total marks of internal and external should be 40% of the total marks to be awarded.

C) ATKT Rules: As per University rules.

D) Award of Class:

Overall class at Third Year B.Sc. Electronic Science will as per University rules as follows -

- Above 70% First class with distinction
- Between 60% to 70% First Class
- Between 50% to 60% Second Class
- From 40% to 50 % Pass class.

However the marks in the Electronic Science papers at Second Year B.Sc. course will be taken into account, for awarding the ultimate class of the course at T.Y.B.Sc.

E) External Students:
Not applicable for this course. External Students are not allowed.

F) Setting of Questions paper/ Pattern of Question paper:
Setting of the question paper is as per University Schedule and it is centralized system adopted by University of Pune. Pattern of question paper will be as per decided by Board of Electronic Science, University of Pune.

G) Verification of Revaluation: As per University Statutes and rules for verification and revaluation of marks in stipulated time after declaration of the semester examination result.

6) Structure of the course : **Total six Theory in each semester and Three Practical courses.**
i) a) Compulsory Paper : Five theory papers in Semester III and Semester IV
b) Optional Paper : One (Paper VI)

Course Structure

Paper	Semester-III		Semester-IV	
Paper I	EL-331	Advanced Digital System Design	EL-341	Advanced Communication Systems
Paper-II	EL-332	Microcontrollers	EL-342	Microcontroller and its Applications
Paper III	EL-333	Analog Circuit Design and Applications of Linear IC's	EL-343	Power Electronics
Paper IV	EL-334	Principles of Semiconductors Devices	EL-344	Foundations of Nanoelectronics
Paper V	EL-335	'C' Programming	EL-345	Mathematical Methods and Circuit Analysis using MATLAB
Paper VI	EL-336 A) B)	Optional Course Fiber Optic Communication Electronic Product Design and Entrepreneurship	EL-346 A) B)	Optional Course Industrial Automation Consumer Electronics
Paper –VII	EL-347	Practical Course I		
Paper –VIII	EL-348	Practical Course II		
Paper –IX	EL-349	Practical Course (Project)		

Note : Vocational courses will be substituted in place of PAPER V AND VI
c) Question paper : <u>Theory -</u>

- **For Internal Examination 10 Marks**
- **For Semester Examination 40 Marks**

<u>Practical-</u>

- **For Internal Examination 20 Marks**
- **For Semester Examination 80 Marks**

ii) Medium of instructions: ENGLISH

7) Equivalence subject/Paper and Transitory Provision:

T.Y.B.Sc. Electronic Science Semester III

Old Syllabus			New Syllabus	
Paper I	**EL331**	Advanced Digital System Design	**EL331**	Advanced Digital System Design
Paper II	**EL332**	Microcontroller	**EL332**	Microcontrollers
Paper III	**EL333**	Analog Circuit Design and Application of Linear IC's	**EL333**	Analog Circuit Design and Applications of Linear IC's
Paper IV	**EL334**	Foundation of Nanoelectronics	**EL344**	Foundation of Nanoelectronics
Paper V	**EL335**	'C' Programming	**EL335**	'C' Programming
Paper VI	**EL336**	Optional Courses	**EL336**	Optional Courses
	A)	Fiber Optic and Fiber Optic communication	**A)**	Fiber Optic Communication
	B)	Sensor & Actuators	**B)**	Industrial Automation
Paper VII	**EL-347**	Practical Course- I	**EL-347**	Practical Course- I
Paper VIII	**EL-348**	Practical Course- II	**EL-348**	Practical Course- II
Paper IX	**EL-349**	Practical Course- III (Project Course)	**EL-349**	Practical Course- III (Project Course)

T.Y.B.Sc. Electronic Science Semester IV

Old Syllabus			New Syllabus	
Paper I	**EL341**	Advanced Communication Systems	**EL341**	Advanced Communication Systems
Paper II	**EL342**	Embedded System	**EL342**	Microcontroller and its Applications
Paper III	**EL343**	Power Electronics	**EL343**	Power Electronics
Paper IV	**EL344**	Electronic Material and Devices	**EL334**	Principles of Semiconductors Devices
Paper V	**EL345**	Mathematical methods and Analysis using MATLAB	**EL345**	Mathematical methods and Analysis using MATLAB
Paper VI	**EL346**	Optional Courses	**EL346**	Optional Courses
	A)	Instrumentation	**A)**	Industrial Automation
	B)	Consumer Electronics	**B)**	Consumer Electronics
Paper VII	**EL-347**	Practical Course- I	**EL-347**	Practical Course- I
Paper VIII	**EL-348**	Practical Course- II	**EL-348**	Practical Course- II
Paper IX	**EL-349**	Practical Course- III (Project Course)	**EL-349**	Practical Course- III (Project Course)

8) University Terms:

- **More than 75% attendance is necessary for the course as per University rules.**
- **12 Weeks will be available for completion of theory course.**
- **Practical course I , II and III (Project work) will be throughout the year.**

9) Subject wise Detail Syllabus and Recommended books as follows:

Paper I: Semester III

EL 331: Advanced Digital System Design

Unit 1: Digital System [14]

Digital system design process- Basic design loop, design flow for logic circuits, Mealy & Moore sequential machine models, state machine notation, state equivalence, state reduction, Equivalence classes, Implication charts, state reduction of incompletely specified state tables, Merger graphs, only importance of state assignment techniques, state assignment permutations formula, ASM symbols

Unit 2: Verilog Hardware Description Language [20]

Importance of HDL's, features of Verilog HDL, Overview of Digital Design with Verilog HDL, Hierarchical modeling concepts, Basic concepts of Verilog- Operators, comments, Number specifications, strings, Identifiers& keywords, Data types, system tasks & Compiler Directives, Modules & ports.
Gate level Modeling- Gate types, Gate delays
Data flow modeling- Continuous Assignments, Delays expression, operators & operands
Behavioral Modeling- Structured Procedures, Procedural Assignments, Timing Controls, Conditional statements, Multiway Branching, Loops
Examples of Verilog Design- Multiplexer, Demultiplexer, Encoder, Decoder, Half Adder, Full Adder, Subtractor, Flip Flop, Counter, and Shift register.

Unit 3: Programmable Logic Design [08]

Introduction, fixed function IC's, ASICs, PLD, ROM as PLD, SPLD- PLA, PAL, GAL, CPLD, FPGA

Unit 4: Case Study [06]

Traffic light controller, Stepper motor sequence generator, Vending machine, Tablet filling system

Recommended Books:

1. Digital logic: Applications & design by John M. Yarbrough, cengage Learning India(Thompson)
2. Verilog HDL A guide to digital design & synthesis By Samir Palnitkar, Pearson Second Edition
3. Fundamental of digital logic with Verilog By Stephen Brown, Zvonko Vranesic, Tata McGraw Hill
4. Digital fundamentals By Floyd, Thoms, Jain R.P., Pearson

Paper II: Semester III

EL-332: Microcontrollers

Learning objectives

1. To learn architecture of 8-bit microcontroller.
2. To use instruction set and addressing modes of microcontroller.
3. To develop assembly language programming skills.
4. To interface memory and I/O devices.

Unit 1: Microcontroller architecture [16]

Introduction to microcontrollers, 8051 Core microcontroller block diagram, program counter, Data pointer, A and B registers, Flags and PSW, internal RAM and ROM, stack and stack pointer, SFRs, Pin configuration, I/O ports, clock and reset circuitry, External memory ,Timers and counters, Serial I/O, interrupts.

Unit 2: Instruction set [16]

Addressing modes, Different groups of instructions- Data transfer instructions, Logical operations, Arithmetic operations, Jump and call instructions. Programs based on arithmetic, logical, code conversion, block data transfer.
Timers and counters, delay generation using timer, waveform generation using timer

Unit 3: Development tools and integrated development Environment [4]

Algorithms, Flow charts, Program Designing, Editors, Assemblers, Compilers, Linkers, Cross compiler, Simulator, Debugger and Emulator, Keil IDE and Proteus.

Unit 4: Interfacing memory and I/O devices [12]

LED/s, relay, DC motor , Stepper motor, seven segment display, LCD, DAC, switch/s, Thumb wheel Switch , keys ,matrix keyboard.
External memory interfacing – RAM, ROM, EPROM

Recommended Books-

1. The 8051 Microcontroller Architecture, Programming and application [Second Edition] Kenneth J. Ayala, Penram International (1999)
2. The 8051 Microcontroller and Embedded Systems using Assembly and C M.A.Mazidi,J.G.Mazidi, R.D.Mckinlay. Pearson Education Second Edition 2009
3. The 8051 Microcontroller and Embedded Systems using Assembly and C, Kenneth J. Ayala, Dhananjay V. Gadre. Cengage Learning
4. Microcontrollers [Theory and Applications] Deshmukh Ajay V. TMH

Paper III: Semester III

EL-333 Analog Circuit Design and Applications of Linear ICs

Learning objectives:

1. To study the practical design aspects while using Opamps
2. To study the basic application circuits of Opamps
3. To Learn the specifications and selection criterion for linear ICs
4. To obtain information about different special purpose ICs and their applications
5. To refer and understand data manuals.

Unit 1: Practical Considerations for Op-amp Circuit Design [10]

Practical consideration with Op-amps: selecting Op-amps for dc, low frequency and high frequency applications, earth loops, interference noise/ shielding and guarding, supply bypassing, offset compensation / balancing techniques, stability of op-amp circuits and technique for frequency compensation.

Unit 2: Basic Application Circuits using Opamp [12]

Design of basic and practical integrator and differentiator circuits
Active filters: 2^{nd} and higher order, Design of LP, HP and BP filters
Log and antilog amplifiers: transdiode configuration and diode connected transistor configuration for log amplifier, Practical log and antilog amplifiers, Precision half wave rectifier, precise full wave rectifiers with equal resistor and one with high input impedance, peak detectors, sample and hold circuits.
Introduction to operational transconductance amplifier (OTA) - LM13600 or equivalent.

Unit 3: Basic Application Circuits using Linear ICs [14]

Voltage comparators using op-amp as well as comparator IC (LM311), design of inverting and non-inverting Schmitt trigger, ON-OFF controller using comparator
Astable and mono stable multivibrators using op-amp.
Timer IC555: Block diagram, astable and mono stable multivibrators
Function generators: LM 566, ICL8038
Four quadrant multiplier and its applications - AD534 or equivalent
Balanced modulator - IC1496/ 1596

Unit 4: Voltage Regulators and Phase Lock Loops [12]

Voltage references: band gap reference, LM385
Linear Regulators: Fixed three terminal regulators ICs-78XX, 79XX; Adjustable Three terminal regulators ICs LM317, LM337, LM723- Block diagram, working, Design for Low and high voltage regulators, design for high and low output current, PWM controller IC3524
Phase lock loop (PLL): Monolithic IC LM565, operating principle, block diagram, PLL characteristics, applications of PLL such as frequency multiplier and FSK

Recommended Books:

1. George Clayton and Steve Winder, “Operational Amplifiers,” 5th Edition Newnes An Imprint of Elsevier
2. Sergio Franco, “Design With operational Amplifiers and analog integrated circuits,” TMH
3. Ramakant A. Gayakwad, “Op-Amps and Linear Integrated Circuits,” 4th Edition PHI
4. R.F. Coughlin, F.F. Driscoll, “Operational Amplifiers and Linear Integrated Circuits,” Prentice Hall.
5. James M Fiore, “Operational Amplifiers and Linear Integrated Circuits,” Jaico Publishing house.

Paper IV: Semester III

EL-334: Principles of Semiconductor Devices

Learning Objectives:

1. To introduce crystal structure with reference to semiconductors
2. To study the theory of metal-semiconductor and p-n junctions
3. To understand the characteristics of semiconductor devices
4. To introduce theoretical background of BJT and FETs

Unit 1: Fundamentals of Semiconductors [14]

Crystal structure: Basic Lattice Types, Basic Crystal Structures, Miller Indices, bulk semiconductor growth and epitaxial growth techniques
Photoelectric effect, Bohr model, hydrogen atom
Electronic levels in semiconductors bonding forces and energy bands in semiconductors, metal semiconductors and insulators, direct and indirect semiconductors, charge carriers**,** Fermi level and temperature dependence, carrier drift in electric and magnetic field
Excess carriers in semiconductors: optical absorption, photo and electro-luminescence, carrier lifetime and photoconductivity, diffusion of carriers

Unit 2: Junctions [12]

Equilibrium conditions: contact potential, space charge at junction.
Forward and reverse bias junctions: steady state conditions.
Reverse bias breakdown: Zener and avalanche breakdown mechanism
Metal Semiconductor Junction: Schottky barriers, Current Flow across a Schottky Barrier, rectifying contacts, Ohmic Contacts

Unit 3: Bipolar Junction Transistors [10]

BJT structure and operation, BJT Characteristics, Minority carrier distributions and terminal currents, current transfer ratio. Coupled diode model (Ebers-Moll Model).
Switching: cutoff, saturation, switching cycle.
Effects: Drift in the Base region, Avalanche Breakdown, base resistance and emitter Crowding Effect, Injection and Thermal Effects

Unit 4: Field Effect Transistors (FETs) [12]

Junction FETs (JFETs) and Metal Semiconductor FETs (MESFETs): The Ohmic Region, Pinch-off and saturation, GaAs MESFET, Current-Voltage Characteristics.
MOSFET: Basic operation of Metal Insulator Semiconductor FETs, Metal-Oxide-Semiconductor Capacitor, Capacitance-voltage relation of MOS structure
Output and transfer Characteristics of MOSFET, Mobility model, control of threshold voltage, Substrate Bias Effects, Sub-threshold Characteristics, Electrical equivalent circuit of MOSFET

Text / Reference Books:

1. Solid State Electronics Devices, Ben G. Streetman and Sanjay Kumar Banerjee, PHI, 6th Edition.
2. Semiconductor Physics and Devices Basic Principles, Donald A. Neamen, TMH, 3rdEdition.
3. Semiconductor Device Physics and Design, Umesh K. Mishra and Jasprit Singh, Springer.
4. Semiconductor Device fundamentals, Robert F. Pierret, Pearson Education.

Paper V: Semester III

EL -335: 'C' Programming

Learning Objectives:

1. To understand fundamentals of C language.
2. To develop algorithm/flowcharts for problem solving and writing programs.
3. To learn to use functions, arrays, pointers and file handling in C language.
4. To study different types of algorithm.

Unit 1: C- Fundamentals [16]

Introduction, character set, constants and variables, Key words, Symbolic constant, statements, entering and executing C program, input and output simple and formatted functions, operators and expressions, control structures and loops and programming examples.

Unit 2: Functions, Arrays and Pointers [14]

Defining a function, Accessing a function, function prototype, passing argument, recursion e.g. Defining and processing of an array, passing array to a function, Pointers declarations, passing pointers to a function, operations of Pointers, pointers as function parameters and programming examples.

Unit 3: String and File handling [08]

Operations on string, string length, string size, string copy, string concatenation, string compare, Opening and closing of data file, read and write data file, processing data file and append data file.

Unit 4: Algorithms [10]

Algorithm definition, properties of algorithm, sorting algorithm, Bubble sort algorithm, selection sort algorithm, Insertion sort algorithm, quick sort algorithm, linear search algorithm and Binary search algorithm.

Recommended Books:

1. J. Jayasri The 'C Language Trainer with C Graphics and C++ WILEY
2. Byron. S. Gottfried Schaum's Outline of Programming with C TMH
3. E Balaguruswamy Programming in –C BPB
4. Stephens Cochan Programming in C Prentice hall of India Ltd
5. V. Rajaraman Computer Programming in C Prentice hall of India Ltd.
6. Madhusudan Mothe C for Beginner shroff / the x team reprints

Paper VI: Semester III

EL-336: A) Fiber Optic Communication

Learning Objectives:

1. To understand the principles of fiber optic communication system.
2. To learn measure different parameter of optical fibers.
3. To understand essential optical components of Fiber Optic Communication.
4. To study the applications of fiber optic communication systems.

Unit 1: Introduction [12]

Basic structure of optical fiber, ray transmission theory, propagation of light in optical fiber, acceptance angle, numerical aperture, skew rays, Dispersion in optical fiber.
Types and specification of single mode, multimode, step index, graded index, glass and plastic fibers and advanced optical fiber.

Unit 2: Optical sources and detectors [12]

LED and LASER diode, Principles of operation, concepts of line-width, phase noise, switching and modulation characteristics-typical LED and LD structures
PN detector, PIN detector, avalanche photodiode-principles of operation, concepts of responsivity, sensitivity and quantum efficiency.

Unit 3: Fiber optic Losses and Measurement. [12]

Attenuation in optical fibers, material or impurity losses, scattering losses, absorption losses, bending losses. Fiber optic link structure and link losses, connector and splicing losses. Fiber attenuation measurement, Dispersion measurement, profile measurement, Numerical aperture measurement, Diameter measurement.

Unit 4: Fiber optic communication [12]

Block Diagram of fiber optic communication, selection of optical fiber types for short haul, long haul and high speed data links, optical power and dispersion budget calculations of fiber optic communication link, Repeaters, optical fiber amplifiers, optical fiber transmitter and optical fiber receiver design considerations.

Recommended Books:

1. G. Kaiser Optical fiber communication McGraw Hill
2. Subir kumar Sarkar Optical fibers and fiber optic communication systems S.Chand and Company
3. R. P. Khare Fiber optics and optoelectronics oxford University Press
4. John M. Senior Optical fiber communications Principles and Practice, (2nd edition) PHI
5. Ajoy Ghatak and K. Thyagarajan Introduction to fiber optics Cambridge University Press
6. D. C. Agarwal Fiber optic communication wheeler Publication

Paper VI: Semester III

EL-336: B) Electronic Product Design and Entrepreneurship

Learning Objective:

1. To provide a basic understanding of electronic product design..
2. To get fundamental knowledge of Entrepreneurship.
3. To design small scale projects for Enterprises.
4. After successfully completing the course students will be able to search / develop self employments.

Unit 1: Product Design and Development [12]

Introduction, Product development basics, Product development stages, Identification of customer requirements, Designing the product, Techno commercial feasibility of a product, Pilot production batch, Product assessment, Failure rates of electronic components, Touch screen, Multi- touch technology.

Unit 2: Entrepreneurship Development [12]

Introduction to entrepreneurship, Identification of opportunities for entrepreneurship, Concept of different occupations: - business, employment and profession. Functions of an entrepreneur. Business idea and plan, Types of businesses / ownerships – Sole Proprietorship, Partnership,
Private limited company, Public limited company, Joint stock Company, Co-operative society.

Unit 3: Sources of Finance [12]

Preparation of project report for business, Sources of finance – government and nongovernment agencies, Working capital, Cash flow, Fund flow, Preparation of basics of financial statements, costing and pricing, Policies and incentives for small business development, Government policies and incentives,

Unit 4: Marketing Management [12]

Small business management and entrepreneurship, Woman entrepreneurship, Features of small business firms, Process of management in small business, Concept of data and information, Information as a commodity, Study of marketing strategy and marketing mix,
Decision-making models, Types of decisions, Decision Support Systems, Introduction to e-commerce, types – B2B, B2C, C2B, C2C etc. Case study on Small scale industries in India.
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Recommended Books:

1. R. G. Kaduskar, V. B. Baru. Electronic Product Design. Second edition Wiley India
2. Alpana Trehan. Entrepreneurship. Wiley India
3. G. N. Pandey. A complete guide to successful Entrepreneurship, Vikas Publishing house Pvt. Ltd. 576, Masjd Road Jangpura, New Delhi 110014.

4. Waman S. Jawadekar, "Management Information Systems", Mc-Graw-Hill Education (India) Pvt. Ltd.
5. G. S. Batra , “Development of Entrepreneurship ”, Deep and Deep Publications, New Delhi
6. Ashwathappa, “Human Resource Management”, Mc-Graw-Hill Education (India) Pvt. Ltd.
7. M.Y. Khan and P. K. Jain, “Financial Management”, Mc-Graw-Hill Education (India) Pvt. Ltd.
8. Ravi M. Kishore, “Project Management”, Mc-Graw-Hill Education (India) Pvt. Ltd.

Paper I: Semester IV

EL-341: Advanced Communication Systems

Unit 1: Antenna & Propagation [14]

Antenna**:** Basic consideration, Evolution of Dipole antenna, Parameters of Antenna, Effect of ground on Antennas. Resonant Antenna- Radiation patterns & length considerations, Non-Resonant antenna, Directional high frequency antennas, UHF & Microwave antenna, Wide-band & special purpose antennas

Propagation of Waves**:** Ground (Surface waves), sky wave propagation, space waves, Tropospheric scatter propagation.

Unit 2: Modulation & Demodulation [12]

Balanced Modulator- Using diodes & FETs

SSBSC- Filter Method, Phase shift method (third method)

Synchronous Demodulation, Product Demodulator,

Phase modulation & demodulation using PLL, Indirect method of FM generation.

Unit 3: Transmitter & Receiver [12]

AM transmitters: Block diagram,

FM Transmitters: Using Frequency multiplication & mixing, Frequency stabilized reactance FM transmitter, FM achieved through phase modulation

TV transmitter (monochrome/colour) Mobile receiver block diagram (800MHz), Doppler RADAR, Speed Gun, Low noise amplifier block diagram

Unit 4: Digital Communication [10]

Pulse modulation, Pulse code modulation, Differential Pulse Code Modulation, Delta modulation, Adaptive delta modulation, Companding, TDM, FDM, Vocoders

Block diagram- Digital Communication System

Recommended Books:

1. Electronic Communication By Dennis Roddy & John Coolean, Pearson Education
2. Principles of Communication Systems By Taub Schilling, McGraw Hill.
3. Antenna Theory: Design & Analysis By Balanis, Wiley Eastern
4. Electronic Communication systems By Kennedy & Davis, Tata McGraw Hill

Paper II: Semester IV

EL-342: Microcontroller and its Applications

Learning objective:-

1) Use 'C' language for programming the microcontrollers
2) Learn to use Timers, Interrupts and Serial Communication in Microcontroller.
3) Apply the knowledge in real world applications

Unit 1: Microcontroller programming [12]

C Data types for 8051, C Programs for Time Delays & I/O Operation, I/O Bit Manipulation, Arithmetic and Logical Operations, ASCII and BCD Data Conversion.

Unit 2: UART, INTERRUPT, TIMER Programming [14]

Timer programming - Timers and counters, delay generation using timer, waveform generation using timer. Serial Port Programming in C, Serial Data Transfer to Microcontroller from PC and from PC to Microcontroller, Interrupt programming

Unit 3: Microntroller applications using embedded 'C' [12]

Interfacing with 8051 and programming using C – LED/s, SSD, LCD, Stepper Motor, DC motor, DAC, ADC, Keys, Matrix keyboard, Switches, TWS, RTC (DS 12887).

Unit 4: Introduction to PIC microcontroller [10]

Comparison of CISC and RISC architecture, Architecture (WREG register, PIC file register, SFRs, GPR, GP RAM, File register and access bank in the PIC18, PIC status register), Feature of PIC 18F4580, reset and oscillator circuit, Pin configuration (18F4580), Port description, Memory organization, Introduction of PIC programming using MPLAB.

Recommended Books-

1. M.A. Mazidi, J. G. Mazidi, R.D. Mckinlay The 8051 Microcontroller And Embedded Systems, Using Assembly and C Pearson Education , Second Edition (2009)
2. Kenneth J. Ayala,Dhanjay V. Gadre The 8051 Microcontroller And Embedded Systems, Using Assembly and C Cengage Learning
3. M.A. Mazidi, R.D. Mckinlay, Danny Causey PIC Microcontroller and Embedded System using Assembly and C Pearson Education.

Paper III: Semester IV

EL- 343: Power Electronics

Learning objectives:

1. To get introduce to basics of power electronics and familiar with Power Electronic Devices, circuits and applications
2. To learn about power devices and protections of devices
3. To study various types of power circuits
4. To study applications of power electronics

Note: Scope of the syllabus is limited to **single phase circuit** unless otherwise specified.

Unit 1: Introduction to Power Electronics [8]

Definition of power electronics, Applications of power electronics, classification of power semiconductor devices, control characteristics of devices, characteristics of power devices as a switch, switching power losses, types of Power circuits, Concept of single phase and three phase using phasors, basics of magnetic circuits

Unit 2: Power Devices, Protection and Driving circuits [10]

Power Diode (P-i-N): construction, Reverse recovery characteristics, diode in series and parallel, freewheeling diode
Power BJT, power MOSFET, IGBT: Steady state and Switching Characteristic, Driving circuits
Thyristors: Types of Thyristors, SCR characteristics, Two transistor static and transient model, turn-on methods, turn-off characteristics, dv/dt and di/dt protection, gate protection circuits, gate driving circuits using BJT, UJT and PUT
Thermal management of heat sinks for power devices and its design from Safe operating Area (SOA).

Unit 3: Power Circuits [18]

Rectifiers: Performance parameters, Half wave, Full wave centre tapped and bridge rectifier with resistive and inductive loads, DC Filters: concept of C, L and LC filters
Controlled rectifiers: Principle, Semi, Full and Dual Converters
AC voltage controllers: on-off control, Phase angle control, Bi-directional control with Resistive load, transformer tap changer, Cycloconverter
Choppers: Step-up, Step-down, concepts of choppers operating in various quadrants
Regulators: Buck and Boost regulators
Inverters: Performance parameters, principle, Half Bridge and full Bridge inverter, Voltage control methods, Inverter filters, introduction to current source inverter
DC Switches, Solid state relays, AC Switches and Microelectronic relays

Unit 4: Applications [12]

Power Supplies: Switch mode power supply (DC) using flyback, forward, half bridge and full bridge converters, Uninterrupted power supply (UPS) .
Electrical motor drives: DC motor drives using Choppers, Introduction to Induction (AC) and synchronous motor drives using three phase inverters.

High frequency florescent lighting, Induction heating and electric welding.

Recommended Books:-

1. M.H. Rashid Power electronics: Circuits, Devices and Applications , third Edition (2004) Pearson Education
2. Ned Mohan , undeland, Robbins Power Electronics , Third Edition (2006) John Wiley & Sons
3. O.P. Arora Power electronics Laboratory : theory , Practice & Organization Narosa Publishing house (2007)
4. P.C. Sen Power Electronics Tata Mc Graw Hill, (1998)

Paper IV: Semester IV

EL -344: Foundation of Nanoelectronics

Learning Objectives:

1. To learn essential principles of Electromagnetics
2. To know the principles of quantum mechanical aspects
3. To study the basics of nanoelectronics.

Unit 1: Essential Electromagnetics [14]

Lorentz force-Motion of charged particle in E-M fields, cyclotron frequency, Hall effect, Maxwell's equations, Relation with laws of Electrodynamics, Equation of continuity, Poynting vector theorem, Wave equation for E and H, properties of EM waves in conducting and nonconducting media , Skin depth.

Unit 2: Quantum mechanical aspects [12]

Particles and Waves: Classical particles, Light as wave and particle, Wave particle duality and Uncertainty principle, Wave mechanics: The Schrödinger wave equation, wave mechanics of particles, Infinite potential well, Qualitative treatment of square wave potential with special reference to tunneling phenomenon, atoms and atomic orbital.

Unit 3: Statistical aspects [10]

Classical statistics, Gaussian distribution, Poisson distribution, Fermi-Dirac, Bose Einstein, Maxwell Boltzmann statistics, Time and length scales of the electrons in solids, statistics of electrons in solids and nanostructures, Density of states of electrons, electron transport, Conductivity of metals.

4. Nanoelectronics [12]

Importance of nanoelectronics, Top down approach, Bottom up approach, Lithography, Nanostructure devices like resonant-tunneling diode, electrons in quantum wells, electrons in quantum wire, electrons in quantum dots, Quantum dot applications, Flash Memory.

Recommended Books:

1. George W. Hanson "Fundamentals of nanoelectronics", LPE, Pearson Education
   V. Mitin ,Viatcheslav A. Kochelap , Michael A. Stroscio Vladimir
2. "Introduction to NanoelectronicsScience ,nanotechnology , Engineering and Applications"
   Cambridge University Press 2008
3. Ben G. Streetman ,Sanjaykumar Banerjee "Solid State Electronic Devices ", 6th Edition
4. Kraus and Fleisch "Electromagnetics with applications" McGraw Hill, 5th edition
5. Electromagnetics by B.B. Laud, Wiley Edition
6. Donald A.Neaman, "Semiconductor Physics and devices" 3rd edition TMH

Paper V: Semester IV

EL- 345: Mathematical Methods and Circuit Analysis using MATLAB

Learning Objectives:

1. To learn features of MATLAB as a programming tool.
2. To promote new teaching model that will help to develop programming skills and technique to solve mathematical problems.
3. To understand Laplace Transform and Fourier series and its applications.
4. To use MATLAB as a simulation tool.

Teaching Methods

1. This course should be taught in classroom and computer laboratory simultaneously.
2. No separate practical are to be conducted for this course.
3. Exercises /programs (or equivalent) from this course are to be demonstrated using computer.
4. Equipped computer laboratory with sufficient number of computers is to be made available for teaching of this course along with projector facility.

Unit-1: Introduction to MATLAB [20]

Working in command window, Built in function, Array-1D, 2D & mathematical operations with array, Script files, 2D & 3D plots.
Functions: -inline, functional evaluationfeval.
Programming: -Conditional statement, Switch-case statement, loops, nested loops, break &continue statement, polynomial operations.

Unit-2.Fourier Series [10]

Definition, Evaluation of Fourier Coefficient, Fourier series for square wave, triangular, sawtooth wave, half wave & full wave rectifiers.
MATLAB exercise: To evaluate Fourier coefficients for given waveform function.

Unit-3. Laplace Transform and its applications [12]

Definition, Laplace transform of simple functions, properties of L.T. (Linearity, shifting, change of scale), Inverse L.T., Partial fraction technique to find inverse L.T.function
Applications. Series RC circuit, RL circuit, RLC circuit for dc input.
MATLAB Exercises: 1.To find Laplace Transform and Inverse LT of any given function.
2.Transient analysis of RC / RL/RLC (series) circuit

Unit-4. Mathematical Applications [6]

Curve fitting(Straight line, Exponential) and its application to
1. Diode characteristics
2.Ohm's Law
3. RC Filter

MATLAB Exercises: Real root of algebraic equation

Recommended Books:

1. Amos Gilat MATLAB : An introduction with applications Wiley India
2. G K Mittal Network Analysis Khanna Publishers , New Delhi
3. Van Valkenberg Network Analysis, 3rd Edition Dorling Kindersley (India) Pvt Ltd
4. Umesh Sinha Network Analysis and Synthesis Satya Prakashan, Delhi.
5. RudraPratap Getting Started with MATLAB , 7th Edition Oxford University Press, N Delhi
6. Stephen J. Chapman MATLAB Programming For Engineers. Thomas Learning

Paper VI: Semester IV

EL-346: A) Industrial Automation

Unit-1: Generalized configuration and performance characteristics of instrumentation system (14)

Functional Elements of an instrument, active and passive transducers, Working principle and specification of thermal sensors like thermister, thermocouple, optical sensors photodetector, and optical encoder, Mechanical sensors LVDT, magnetic sensor hall effect etc. Analog and Digital Modes of Operation, Null and Deflection Methods, Input Output configuration of Instruments and measuring systems. Working principle of electromechanical relay, heater, LED/LCD display.

Generalized measurements, zero-order System, First-order System, Second–order System,

Dead-Time Element, Specifications and Testing of Dynamic Response.

Unit 2 :Manipulating, Computing and Compensating devices (10)

Bridge circuits, Operational Amplifiers, Instrumentation Amplifiers, Transconductance and Transimpedance Amplifiers, Noise Problems, Shielding and Grounding,
Generalized Data Acquisition system- Elements of a data acquisition system, Single channel Data Acquisition system, Multichannel Data Acquisition system, Sample and Hold circuits, ADC, DAC, Multiplexers.

Unit 3: Fundamentals of Process automation (12)

Process control system: Continuous control, discrete state control, composite discrete/continuous control, Ladder Diagram: Ladder diagram elements with examples.
Process Characteristics: Process equation, Process load, Process lag, self regulation
Control system parameters: Error, Variable range, control parameter range, control lag, dead time, cycling,

Unit 4: Controller modes (12)

Discontinous controller modes: Two position mode, Multiposition mode, floating control mode Continuous controller modes: Proportional control, Integral control, Derivative control and composite modes Proportional-Integral , Proportional derivative, Proportional-integral –derivative(PID).

Recommended Books:

1. C.D. Johnson, Process control Intrumentation Technology John Willy and Sons, Inc., 3rd Edition
2. C S Rangan,G R Sarma,V S Mani:Instrumentation Devices & Systems , 2nd Edition TMH
3. Ernest O Doebelin, Dhanesh N Manik:MEASUREMENT SYSTEMS Application and Design , 5th Edition Tata McGrawHill
4. Joseph J. Carr:Elements of Electronic Instrumentation and Measurement , 3rd Edition Pearson Education
5. H S Kalsi:Electronic Instrumentation, Second edition, Tata McGraw Hill Pub.

Paper-VI: Semester IV

EL-346: B) Consumer Electronics

Unit-1: Audio Systems (08)

Introduction to: Microphone, Loudspeaker and Music System: Principle, construction, working and characteristics

Microphone: Different types of microphone: Electret & carbon microphones

Special Microphones: Lavalier microphone, Tie-clip microphone, Radio microphone and Noise cancelling microphone.

Loudspeakers: Characteristics of Loudspeaker, Horn type, Multiway speaker system (Woofers & Tweeters).

P.A. System: Block diagram of P.A. system, requirements of P A system, typical P.A. Installation planning (P.A. system for a public meeting in Public Park and P.A. System for an auditorium having large capacity)

Unit 2: TV and Video Systems (12)

Television: standards, B/W/Colour, CRT/HDTV

Video Systems: VCR/VCD/DVD players, MP4 players, Set top Box, CATV and Dish TV, LCD, Plasma and LED TV, Projectors, Home theaters

Unit 3: Telephone Systems (08)

Basic land line equipment, Telephone set, working, telephone exchange, Initiating call, calling a no., pulse dialing and tone dialing, signal to /from exchange, dial tone, dial back and engage signals, making connection, answering call, conversion, ending call, Modems, telex, PBX, PABX, transmitter and receiver. Cordless Phones: Principle of operation, Block diagram of the base unit, Block diagram of the Handset, Features and specifications.

Cellular Phones - Operating principle, the cell approach, Block diagram, Functions performed by cell phones, features/ specifications.

GPRS and Bluetooth, GPS Navigation system

Unit 4: Office Equipments and Modern Home Appliances (20)

Office Equipments: Scanners-Barcode/Flatbed, Printers, Xerox machine, Multifunction Unit (Print, scan, fax, copy

Home Appliances: Microwave Oven – Principle of operation, Block Diagram, features and specifications

Washing Machine/ Dish washers - Principle of operation, fuzzy logic, Washing machine with fuzzy logic, Block Diagram, features and specifications.

Remote Control: Operating Principle, Block Diagram, Operation and features.

Electronic Weighing Systems - Operating principle, Block diagram, features.

Digital Camera, Handicam, Home security System

Reference Books:

1. Audio and Video systems by R.G. Gupta Tata McGraw Hill (2004)
2. Modern CD player servicing Manual by Manahar Lotiya
3. Modern Telephone and cordless servicing by Manahar Lotiya
4. Consumer Electronics by J. S. Chitode Technical Publications, Jan-2007
5. Television- By Gulati, New Age International.
6. Mobile cellular telecommunications analog and digital system- By Lee.
8. Mobile cellular communication- By William C. Y. Lee, 2nd edn 1985, McGraw Hill Publication.
9. Consumer Electronics by R.P. Bali, Pearson Education (2008)

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Practical Courses

Aim and Objectives:

1. The practical activities are self learning process, there are three practical courses.
2. There are TWO activities i.e. one for Practical course-I and other for Practical course-II. One activity is equivalent to 4 experiments.
3. There will be no change in the workload in taking 16 experiments and one activity instead of 20 experiments.
4. There will be 16 experiments and one activity in each course. Student select the activity throughout the year he/ she will work on it and at the end submit full activity report individually.
5. Student will prepare **a report on each activity**. It will be evaluated both at internal and university practical examination.
6. The progress of the student activity will access time to time/ weekly/ monthly by the teacher during regular practical timing.
7. This activity will generate good quality of work and prepare good report (study material with practical experience) which will be useful to the teachers, departments, other students etc.

In the practical course examination of 100 marks, 20% weightage will be given to activity done by the student at internal and external examination. The number of experiments according to groups is specified in the following Table.

	Group	Title	No. of Expt.
EL-347: Practical Course-I			
Section I	1	Analog Circuit Design and Applications of Linear ICs	4
	2	Power Electronics	3
	3	Advanced Communication Systems	3
		Total Experiments	**10**
Section II	4	Principles of Semiconductor Devices	3
	5	Fiber optic Communication	3
		Electronic Product Design and Entrepreneurship	
		Industrial Automation	
		Consumer Electronics	
		Activity (Equivalent to **4** Experiments)	4
		Total Experiments	**10**
EL-348: Practical Course-II			
Section I	1	Assembly and C Programming for Microcontrollers	6
	2	Digital System Design using Verilog HDL	4
		Total Experiments	**10**
Section II	3	C Programming	6
		Activity (Equivalent to **4** Experiments)	4
		Total Experiments	**10**

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Paper VII EL-347 Practical Course- I

(2015 Pattern)

There are 20 Experiments in Paper VII EL-347 Practical Course- I
One activity as directed in practical course which will be equivalent to 4 experiments

Internal Practical Examination (Out of 20)

- 16 Marks to Experiments, 04 Marks to Activity

University Annual Practical Examination (Out of 80)

- Two experiments of each of 3 hours duration (40 Marks)
- Section I: 32 Marks for Experiment, 8 marks for oral
- Section II: 24 Marks for Experiment, 16 marks for oral of experiment and activity

Objectives:

1. To refer the various datasheets of the electronic devices and integrated circuits
2. To learn how to select the devices, sensors, actuators and ICs for a particular application
3. To develop the basic skills required to handle the various instruments
4. To learn the designing aspects of circuits/ systems

Section I

Total 10 Experiments to be conducted in the Laboratory

Group 1: Total 4 Experiments

Analog Circuit Design and Applications of Linear ICs

1. Wave shaping circuits (Integrator / differentiator circuit)
2. Op-amp based clipper and clampers
3. Log amplifier using opamp
4. To study gain bandwidth product of inverting/ non-inverting amplifier.
5. Regulated power supply using IC 723 (Low and High Voltage,1A Current)
6. Function generator using 8038/2206 or any equivalent IC
7. Active second order Butterworth Low Pass/ High Pass/ Band Pass/ Band Reject Filter (any two)
8. Astable and monostable multivibrator using IC555.
9. Study of PLL Characteristics IC565/ CD4046/ XR2211 or any equivalent IC

Group 2: Total 3Experiments

Power Electronics

1. SCR/MOSFET/IGBT static characteristics
2. Controlled rectifier
3. Light Dimmer / fan regulator circuit

4. Electronic Ballast
5. PWM based PMDC motor control
6. Buck/Boost Regulator
7. Study of SMPS
8. Emergency light
9. Mains Over voltage/under voltage Protector
10. AC and DC static switches

Group 3: Total 3 Experiments

Communication Systems

1. Amplitude modulation using OTA CA3080 and demodulator
2. FM modulator using VCO
3. FSK modulator and demodulator using XR 2206 and XR2211
4. QASK/ BPSK using op-amp and analog multiplexer (IC CD 4051/52/53)
5. SSB generation using IC 1496/1596 or equivalent and demodulation

Section II

Total 6 Experiments to be conducted in the Laboratory

Group 4: Total 3 Experiments

Principles of Semiconductor Devices

1. Hall effect
2. Four probe method
3. Measurement of Efficiency and fill factor of solar cell.
4. Energy band gap measurement
5. Reverse recovery time measurement of diodes (any two).
6. Angular displacement measurement using Hall Effect sensor.
7. Transfer characteristic of phototransistor/ Photodiode

Group 5: Total 3 Experiments

Fiber Optics and fiber optic Communication

1. Study of propagation loss in optical fibers
2. Study of bending loss in fibers
3. Setting up of fiber optic voice link
4. Measurement of Numerical Aperture
5. Fiber terminations and polishing
6. Fiber in sensor application
7. Design of fiber optic Transmitter
8. Design of fiber optic Receiver
9. Visit to telecom facility for observing splicing, alignment, fusing, OTDR operation, connectorization, types of connectors, couplers and cables

Electronic Product Design and Entrepreneurship

1: Interview a successful entrepreneur.
2: Visit a small business- project report.
3: Identify business opportunities.
4: Market Survey

Industrial Automation

1. Measurement of displacement using potentiometer.
2. LVDT Characteristics- Sensitivity measurement
3. Level measurement using capacitive transducers.
4. Pressure measurement using piezoelectric transducers.
5. Study of Hall Effect transducer
6. Design of Wheatstone's bridge for resistive transducer.
7. Simulation PI, PD and PID controller modes
8. PLC simulation using ladder diagram
9. ON-OFF controller using microcontroller/op amp

Consumer Electronics

1. Study of PA systems
2. Installation of Audio /Video systems
3. Market Survey of Products
4. Identification of block and tracing the system.

[C] Activity:

Circuit design using PSpice (Equivalent to 4 Experiments) **OR** Industrial Visit

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Paper VII EL-348 Practical Course- II

There are 20 Experiments in Paper VII EL-348 Practical Course- I
One activity as directed in practical course which will be equivalent to 4 experiments

Internal Practical Examination (Out of 20)

- 16 Marks to Experiments, 04 Marks to Activity

University Annual Practical Examination (Out of 80)

- Two experiments of each of 3 hours duration (40 Marks)
- Section I: 32 Marks for Experiment, 8 marks for oral for
- Section II: 24 Marks for Experiment, 16 marks for oral of experiment and activity

Objectives:

1. To learn the basic C-Programming
2. To learn Verilog HDL to design basic combinational and sequential circuits
3. To get familiar with structural, data flow and behavioral modeling
4. To learn assembly level language of 8051 microcontroller
5. To use cross compiler to develop C-programs for microcontroller
6. To study the various interfacing circuits to 8051 microcontroller

Section I

Total 10 Experiments to be conducted in the Laboratory

Group 1: Total 6 Experiments

Assembly and C Programming for Microcontrollers

8051 Practical (Practical 1 and 2 in Assembly are compulsory and Practicals 3 to 13 may use in both assembly or C or both)

1. Basic exercises on arithmetic, logical and data transfer operation ,largest, smallest of numbers
2. Programs on code conversion: dec-hex, hex-dec, ASCII – HEX, HEX – ASCII, BCD – seven segment
3. Serial Communication sending string on Hyper terminal , receiving data from Keyboard.
4. LCD interface. a) To display message on both lines b) To display 2-digit BCD counter on second line
5. Interfacing of Keypad / Matrix KBD to 8051
6. Interfacing of DIP switches/TWS to 8051
7. Interfacing SSDs – Non-multiplexed / Multiplexed type
8. Interfacing Stepper Motor – Continuous clockwise , anticlockwise , rotation for fixed angle
9. Interfacing LED Bank / dot matrix display
10. Interfacing ADC (Implement digital voltmeter)
11. Interfacing DAC- Waveform generator (Ramp , Triangular , square) , with different amplitude
12. Event counter, Frequency Counter using Timer/Counter of 8051.

13. Traffic Light Controller(Generate delay using for loop , using Timer/Counter)
14. Design of target board.
15. Program for Flashing of LED on any port of PIC microcontroller.

Group 2: Total 4 Experiments

Digital System Design using Verilog HDL

1. Design 4 to 1 line MUX/ 1 to 4 DEMUX
   Use a) gate level b) data flow c) Structural d) Behavioral style of modeling
2. Design 2-4, 3-8 decoder using a. gate level b. Structural d. Behavioral - modeling) and BCD to Seven Segment Decoder (using Behavioral modeling)
3. Arithmetic circuits: Half adder, Full adder (using gate level , Data flow modeling) and Parallel adder using structural modeling
4. Four bit ALU design using behavioral modeling
5. Design a) 2-bit magnitude comparator using gate level modeling b) 4-bit magnitude comparator using structural modeling
6. Design of flip-flops using : RS, D and T using behavioral modeling and
   Design of Counter using T flip-flops (Use Structural modeling): Asynchronous counter and Asynchronous up/down counter
7. Design the following
   a. Up-down bit binary counter (minimum 4-bit) using behavioral modeling
   b. Shift register using D flip flops(Structural)
   c. Shift register using behavioral modeling
8. Designing of Traffic light Controller
9. Code converter – binary to gray, gray to binary using data flow modeling
10. Encoder- 8 to 3 encoder, priority encoder using behavioral modeling
11. Stepper motor sequence generator

Section II

Total 6 Experiments to be conducted in the Laboratory

Group 3: Total 6 Experiments

'C' Programming

1. Program to compute the following :
   a) Parallel equivalent resistance of n resistors.
   b) Reactance of Inductor , Capacitor in Ω at given frequency
   c) To determine impedance of the series LR circuit.
   d) Resonant frequency of series L(mH),C(μF)
   e) Program to compute Vdc and Vrms values of half wave/Full wave controlled rectifires for different values of firing angle(study of controlled characteristics)
   f) Program to compute Vdc and Vrms values of ac voltage controller for different values of firing angle(study of controlled characteristics)
   g) Program to compute parameters of opamp in inverting and non-inverting amplifiers for given open loop parameters values.
2. Program to compute the following :

a) Generate truth table for boolean function.
b) Determine binary equivalent of an 8-bit integer
c) Convert i) binary to gray ii) binary to decimal iii) hex to decimal

3. Program to compute the following :
   a) Determine the drain current in a FET with an entered threshold voltage, beta and Supply voltage.
   b) Program to determine current flowing in a diode accepting diode voltage, reverse saturation current and junction temperature in Kelvin
4. Transient response of an RC circuit.
5. Develop a program for the following
   a) Determine classification of radio wave.
   b) Solve the given quadratic equation.
   c) Calculate frequency of i) Astable multivibrator using 555 ii) Wein bridge Oscillator iii) Phase shift oscillator
6. Program the following
   a) Determine determinant of matrix
   b) Solve solution of network equation using matrix.
7. Sorting of a) array of numbers b) list of names of students (Bubble Sort).
8. Calculate $\sin x$ and $\cos x$ by Taylor's series.
9. Recursive functions - Factorial of a number, Fibonocci Series.
10. Prime numbers generation.
11. Program on structure – read 10 records, process on data and display the result.

Reference Books:

1. C for Electronics and Computer Engineering Technology.-Peter J. Holsberg
2. C for Electronic Engineering: With Applied Software Engineering -by William Buchanan

Activity: Circuit design using PSpice OR MATLAB Programming (Equivalent to 4 experiments)

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Paper IX: EL-349 Practical Course- III

Project Work

Guideline to conduct Practical Course III

Practical Course III is a project work of 100 Marks.

- Internal project Examination (Out of 20)
- University Annual project Examination (Out of 80)

The project work should be followed with following guidelines.

a) The name and subject of the project type must be well defined.
b) Planning of the work must be specified.
c) Theoretical, reference work must be provided.
d) Pilot experimentations / Preparations must be specified.
e) Typical design aspects, theoretical aspects, aim and objectives of the work must be specified in detail.
f) The actual work done must be reported along with experimentation procedures.
g) There must be observations, interpretations, conclusions, results of the project work.
h) Algorithm, program strategy, module wise description of parts etc be provided in case of projects related with development of computer software.
i) Applications, usefulness, student's contribution in it must be clearly specified.
j) Further extension work may be suggested for better outcome of the project.
k) It is recommended to present the projects in competitions / project exhibitions organized by various authorities.