SCHEME OF INSTRUCTION & EXAMINATION
B.E. III- Semester
(ELECTRONICS AND COMMUNICATION ENGINEERING)

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact	CIE	SEE	Duration in	
Theory Course										
1	HS 102 EG	Effective Technical Communication in English	3	-	-	3	30	70	3	3
2	HS 103 CM	Finance and Accounting	3	-	-	3	30	70	3	3
3	ES 303 EC	Digital Electronics	3	1	-	4	30	70	3	4
4	ES 304 EC	Probability Theory and Stochastic Processes	3	1	-	4	30	70	3	4
5	PC 401 EC	Electronic devices and Circuits	3	-	-	3	30	70	3	3
6	PC 402 EC	Network Theory	3	1	-	4	30	70	3	4
Practical/Laboratory Course										
7	PC 451 EC	Electronic Devices and Circuits Lab	-	-	2	2	25	50	3	1
8	PC 452 EC	Electronic Workshop Lab	-	-	2	2	25	50	3	1
Total			**18**	**3**	**4**	**25**	**230**	**520**	**24**	**23**

PC: Professional Course **HS:**Humanities and Social Sciences **ES:** Engineering Science

L: Lecture **T:** Tutorial **P:** Practical **D:** Drawing
CIE: Continuous Internal Evaluation **SEE:** Semester End Examination (Univ. Exam)

EG: English **CM:** Commerce
EC: Electronics and Communication Engineering

Note:

1. Each contact hour is a ClockHour
2. The duration of the practical class is two clock hours, however it can be extended wherever necessary, to enable the student to complete the experiment

EFFECTIVE TECHNICAL COMMUNICATION IN ENGLISH

HS 102 EG
Instruction: 3 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits: 3

Objectives:

1.Features of technical communication
2.Types of professional correspondence and Techniques of report writing
3.Basics of manual writing and Aspects of data transfer and presentations.

Outcomes: On successful completion of the course, the students would be able to

1.Handle technical communication effectively
2.Use different types of professional correspondence
3.Use various techniques of report writing
4.Acquire adequate skills of manual writing
5.Enhance their skills of information transfer and presentations

UNIT – I
***Definition and Features of Technical communication*:** Definition and features of technical communication(precision, relevance, format, style, use of visual aids), Differences between general writing and technical writing, Types of technical communication (oral and written)
UNIT – II
Technical Writing-I (Official correspondence):Emails, IOM, Business letters, Business proposals.
UNIT – III
Technical writing-II (Reports):Project report, Feasibility report, Progress report, Evaluation report.
UNIT – IV
Technical writing- III (Manuals):Types of manuals, User manual, Product manual, Operations manual.
UNIT – V
Information Transfer and Presentations:Non-verbal (bar diagram, flow chart, pie chart, tree diagram) toverbal (writing), Verbal (written) to non-verbal, Important aspects of oral and visual presentations.

Suggested Reading:

1.	Raman, Meenakshi & Sharma, Sangeeta. (2015). '*Technical Communication: Principles andPractice'*(3rd ed.). New Delhi.
2.	Rizvi,Ashraf, M. (2017) '*Effective Technical Communication'*(2nd ed.).Tata McGraw Hill Education. New Delhi.
3.	Tyagi, Kavita &Misra, Padma. (2011). '*Advanced Technical Communication'*. New

	Delhi, PHI Learning.
4.	Sharma, R. C., & Mohan, Krishna. (2017). ‘*Business Correspondence and Report Writing: APractical Approach to Business & Technical Communication’*(4th ed.).Tata McGraw HillEducation. New Delhi.

For the academic years 2020-2024

FINANCE AND ACCOUNTING

HS 103 CM

Instruction: 3 periods per week — *Duration of SEE: 3 hours*
CIE: 30 marks — *SEE: 70 marks*
Credits: 3

Objectives:

1.To provide basic understanding of Financial and Accounting aspects of a business unit
2.To provide understanding of the accounting aspects of business and financial statements
3. To provide inputs necessary to evaluate the viability of projects and the skills necessary to analyse the financial statements

Outcomes: On successful completion of the course, the students would be able to

1. Evaluate the financial performance of the business unit.
2. Take decisions on selection of projects.
3. Take decisions on procurement of finances.
4. Analyse the liquidity, solvency and profitability of the business unit.
5. Evaluate the overall financial functioning of an enterprise.

UNIT – I
Basics of Accounting: Financial Accounting–Definition- Accounting Cycle–Journal - Ledger and TrialBalance-Cash Book-Bank Reconciliation Statement (including Problems)
UNIT – II
Final Accounts: Trading Account-Concept of Gross Profit- Profit and Loss Account-Concept of Net Profit-Balance Sheet (including problems with minor adjustments)
UNIT – III
Financial System and Markets**:** Financial System-Components-Role-Considerations of the investors andissuers- Role of Financial Intermediaries. Financial Markets-Players- Regulators and instruments - Money Markets Credit Market- Capital Market (Basics only)
UNIT – IV
Basics of Capital Budgeting techniques**:** Time Value of money- Compounding- Discounting- Future Valueof single and multiple flows- Present Value of single and multiple Flows- Present Value of annuities-Financial Appraisal of Projects– Payback Period, ARR- NPV, Benefit Cost Ratio, IRR (simple ratios).
UNIT – V
Financial statement Analysis**:** Financial Statement Analysis- Importance-Users-Ratio Analysis-liquidity,solvency, turnover and profitability ratios.

Suggested Reading:

1	Satyanarayana. S.V. and Satish. D., ‘*Finance and Accounting for Engineering’*, Pearson Education
2	Rajasekharan, ‘*Financial Accounting’*, Pearson Education
3	Sharma.S.K. and Rachan Sareen, ‘*Financial Management’*, Sultan Chand
4	Jonathan Berk, ‘*Fundamentals of Corporate Finance’*, Pearson Education
5	Sharan, ‘*Fundamentals of Financial Management’*, Pearson Education

DIGITAL ELECTRONICS

ES 303 EC

Instruction: 3+1 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits:4

Objectives:

1. To learn the principles of digital hardware and support given by it to the software.
2. To explain the operation and design of combinational and arithmetic logic circuits.
3. To design hardware for real world problems

Outcomes: On successful completion of the course, the students would be able to

1.Understand the deign process of digital hardware, use Boolean algebra to minimize the logical expressions and optimize the implementation of logical functions.
2.Understand the number representation and design combinational circuits like adders, MUX etc.
3. Design Combinational circuits using PLDS and write Verilog code for basic gates and combinational circuits.
4. Analyse sequential circuits using flip-flops and design registers, counters.
5.Represent a sequential circuit using Finite State machine and apply state minimization techniques to design a FSM

UNIT – I
Design Concepts:Digital Hardware, Design process, Design of digital hardware. Introduction to logiccircuits – Variables and functions, Logic gates and networks. Boolean algebra, Synthesis using gates, Design examples. Optimized implementation of logic functions using K-Map and Quine-McCluskey Tabular method
UNIT – II
Number representation:Addition and Subtraction of signed and unsigned numbers. ***Combinational circuit building blocks:***Adders and Subtractors, Multiplexers. Demultiplexers, Parity Checkers and Generators, Decoders. Encoders. Codeconverters, BCD to 7-segment converter, Arithmetic comparator circuits. Verilog modeling of simple combination circuits
UNIT – III
Design of combinational circuits using Programmable Logic Devices (PLDs):General structure of aProgrammable Array Logic (PAL), Programmable Logic Arrays (PLAs), Structure of CPLDs and FPGAs, 2-input and 3-input lookup tables(LUTs)
UNIT – IV
Sequential Circuits:Basic Latch, Gated SR Latch, gated D Latch, Master-Slave edge triggered flip-flops, TFlip-flop, JK Flip-flop, Excitation tables. Registers and Counters. Verilog modeling of simple sequential circuits.
UNIT – V

***Synchronous Sequential Circuits*:** Basic Design Steps, Finite State machine(FSM) representation using Moore and Mealy state models, State minimization, Design of FSM for Sequence Generation and Detection, Algorithmic State Machine charts.

Suggested Reading:

1	Moris Mano and Michael D CIletti, '*Digital Design'*, Pearson, fourth edition,2008
2	Zvi Kohavi, '*Switching and Finite Automata Theory'*, 3rd ed., Cambridge University Press-New Delhi, 2011.
3	R. P Jain, '*Modern Digital Electronics'*,4th ed., McGraw Hill Education (India) Private Limited, 2003
4	Ronald J.Tocci, Neal S. Widmer &Gregory L.Moss, '*Digital Systems: Principles and Applications*', PHI, 10/e, 2009.
5	Samir Palnitkar, '*Verilog HDL A Guide to Digital Design and Synthesis'*, 2nd Edition, Pearson Education, 2006.

PROBABILITY THEORY AND STOCHASTIC PROCESSES

ES 304 EC
Instruction: 3+1 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits :4

Objectives:

1. To understand fundamentals of probability and Random variables as applicable to Electronic Engg.
2.To learn one Random variable characteristic functions of different variables using their density functions
3.To understand elementary concepts of the Stochastic Processes and their temporal characteristics

Outcomes: On successful completion of the course, the students would be able to

1.To understand different types of Random variables, their density and distribution functions
2.To learn one Random variable characteristic functions of different variables using their density functions
3.To extend the bi-variate distributions and the operations on them.
4.To understand elementary concepts of the Stochastic Processes in the Temporal domain.
5.To analyse the frequency domain information of Stochastic Processes

UNIT – I
***Concepts of Probability and Random Variable*:** Probability introduced through Set Theory and Operations – Definitions and Axioms, Causality versus Randomness, Borel Field, Probability Space – Discrete and Continuous, Events - Definition and independent events, Joint Probability, Conditional Probability, Repeated Trials, Combined Experiments, Bernoulli Trials, Bernoulli's Theorem, Total Probability, Baye's Theorem. **Random Variable:** Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables.
UNIT – II
Distribution & Density Functions and Operations on One Random Variable: Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Gamma, Rayleigh and Conditional Distribution, Methods of defining Conditional Event, Conditional Density, Properties.Expected Value of a Random Variable, Function of a Random Variable g(x) and its distribution, Moments about the Origin, Central Moments, Variance and Skew,

Chebychev's Inequality (no proof), Characteristic Function, Moment Generating Function; Transformations of Random Variables
UNIT – III
Two Random Variables and operations Bi-variate Distributions, One Function of Two Random Variables, Two functions of two random variables, Joint Distribution and Density Function and their properties, Joint Moments, Joint Characteristic Functions, Conditional Distributions (Point & Interval), Conditional Expected Values. Central Limit Theorem (no proof); Engineering application (theoretical discussion) – Mutual information, Channel Capacity and Channel Coding.
UNIT – IV
Stochastic Processes – Temporal Characteristics: Introduction to stationarity (First and Second order; WSS; SSS), statistical independence, Time averages and ergodicity, random processes and independence, Mean-Ergodic Processes, Correlation-Ergodic Processes,Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance and its Properties. Linear System Response of Mean and Mean-squared Value. Introduction to Gaussian and Poisson Random Processes.
UNIT – V
Stochastic Processes – Spectral Characteristics: Power Spectral Density and its properties; Relationship between Power Spectrum and Autocorrelation Function; Relationship between Cross-Power Spectrum and Cross-Correlation Function; White and colored noise, response to linear systems and stochastic inputs, concept of Markov Processes.

Suggested Reading:

1	Henry Stark and John W. Woods, *Probability and Random Processes with Application to Signal Processing'*, 3rd edition, Pearson Education, 2014.
2	Athanasius Papoulis and S. Unnikrishna Pillai, '*Probability, Random Variables and Stochastic Processe's*, 4th edition, McGraw Hill, 2006.
3	Peyton Z. Peebles, '*Probability, Random Variables & Random Signal Principles'*, 4th edition, Tata McGraw Hill, 2001

For the academic years 2020-2024

ELECTRONIC DEVICES AND CIRCUITS

PC 401 EC
Instruction: 3 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits : 3

Objectives:

1. Study semiconductor physics and Analyse the behavior of Semiconductor diodes in Forward and Reverse bias. Develop Half wave and Full wave rectifiers with L, C Filters.
2.Explain V-I characteristics of Bipolar Junction Transistor in CB, CE & CC configurations and Design DC Biasing techniques, evaluate A.C parameters for BJT in Amplifier Applications
3.Explore V-I characteristics of FETs, MOSFETs and study IC fabrication techniques

Outcomes: On successful completion of the course, the students would be able to

1. Interpret the characteristics and apply diode models to analyse various applications of diodes.
2. Identify the merits and demerits of various filters, formulate and design rectifier circuits with filters Calculate ripple factor, efficiency and percentage regulation of rectifier circuits.
3. Discriminate the BJT configurations to recognize appropriate transistor configuration for any given application and design the biasing circuits with good stability.
4. Analyse, Compare and design of BJT amplifiers with various biasing circuits.
5.Distinguish the working principles of BJT and FET also between FET & MOSFET

UNIT – I
Basics of Semiconductors*:** Energy bands in intrinsic and extrinsic Silicon. Carrier transport:diffusion current, drift current, mobility and resistivity; Generation and recombination of carriers, Poisson and continuity equation, Hall Effect ***Junction Diode:PN Junction formation, Characteristics, biasing–band diagram and current flow, Diodecurrent equation, Breakdown in diodes, Diode as a circuit element, Small signal diode models, Diode switching characteristics, Zener Diode, Zener voltage regulator and its limitation, Schotky diode.
UNIT – II
PN Diode Applications:Half wave, Full wave and Bridge rectifiers–their operation, performancecharacteristics and analysis. Filters (L, C filters) used in power supplies and their ripple factor calculations, design of Rectifiers with and without Filters. ***Special Diodes**:* Elementary treatment on the functioning of Light Emitting diode, Photodiode and Solarcells.
UNIT – III
Bipolar Junction Transistor:Transistor Junction formation (collector-base, base-emitter Junctions),Transistor biasing – band diagram for NPN and PNP transistors, current components and current flow in BJT, Ebers moll model, Modes of transistor operation, BJT V-

I characteristics in CB, CE, CC configurations, BJT as an amplifier, BJT biasing techniques, operating point stabilization against temperature and device variations, Bias stabilization and compensation techniques, Biasing circuits design.
UNIT – IV
Small Signal Transistors equivalent circuits:Small signal low frequency h-parameter model of BJT,Approximate model, Analysis of BJT amplifiers using Approximate model for CB, CE and CC configurations; High frequency - Π model, Relationship between hybrid - Π and h – parameter model.
UNIT – V
Junction Field Effect Transistors (JFET):JFET formation, operation & current flow, V-I characteristics ofJFET, Low frequency small signal model of FETs, Analysis of CS, CD and CG amplifiers. ***MOSFETs:***Enhancement & Depletion mode MOSFETs, current equation, V-I characteristics, DC-biasing

Suggested Reading:

1	Jacob Millman, Christos C. Halkias, and Satyabrata Jit, '*Electronic Devices and Circuits'*, 3rd ed., McGraw Hill Education, 2010.
2	G. Streetman and S. K. Banerjee, '*Solid State Electronic Devices'*, 7th edition, Pearson, 2014.
3	S. M. Sze and K. N. Kwok, '*Physics of Semiconductor Devices'*, 3rd edition, John Wiley& Sons, 2006.
4	D. Neamen, D. Biswas, '*Semiconductor Physics and Devices'*, McGraw-Hill Education.
5	Robert Boylestad and Louis Nashelsky, '*Electronic Devices and Circuit Theory'*, 11th ed., Pearson India Publications, 2015.

NETWORK THEORY

PC 402 EC

Instruction: 3+1 periods per week — *Duration of SEE: 3 hours*
CIE: 30 marks — *SEE: 70 marks*
Credits : 4

Objectives:

1. Concepts of Two Port networks, study about the different two port parameter representations.
2. Concepts about the image impedance on different networks, design of attenuators.
3. Design concepts of equalizers, different filters, network synthesis

Outcomes: On successful completion of the course, the students would be able to

1.Able to Express given Electrical Circuit in terms of A,B,C,D and Z,Y Parameter Model and Solve the circuits and how they are used in real time applications.
2. Able to learn how to calculate properties of networks and design of attenuators.
3. Able to design of equalizers.
4. Able to design different types of filters using passive elements.
5. Able to synthesize the RL & RC networks in Foster and Cauer Forms..

UNIT – I
Two Port networks:Z, Y, h, g and ABCD parameters, equivalence of two ports networks, T-π transforms, Reciprocity theorem, Interconnection of two port networks and Brune's test for inter connections.
UNIT – II
Symmetrical and Asymmetrical Networks:Characteristic impedance and propagation constant ofsymmetrical T and π networks, Image and iterative impedances, Image transfer constant and iterative transfer constant of asymmetrical L, T and π networks.
UNIT – III
Constant k- Filters-Low pass, high pass, band pass and band elimination filter design, m-derived low passand high pass filter design, Composite filter design and notch filter.
UNIT – IV
Attenuators and Equalizers-Design of symmetrical T, π , Bridge-T and Lattice attenuators, impedancematching networks, Inverse networks, Equalizers, Constant resistance equalizer, full series and full shunt equalizer**.**
UNIT – V
Network Synthesis:Hurwitz polynomials, positive real functions, Basic Philosophy of Synthesis, L-CImmitance functions, RC impedance functions and RL admittance functions. RL impedance functions and RC admittance functions. Cauer and Foster's forms of RL impedance and RC admittance. Properties of RC, RL Networks**.**

Suggested Reading:

1	Ryder J.D, ‘*Network Lines Fields’*, 2nd edition, Prentice Hall of India,1991.
2	P.K. Jain and Gurbir Kau, ‘*Networks, Filters and Transmission Lines’,* Tata McGraw-Hill Publishing Company Limited.
3	A. Sudhakar Shyammohan, ‘*Circuits Networks: Analysis Synthesis’*, 4th edition, Tata McGraw-Hill, 2010.
4	Van Valkenburg M.E, ‘*Introduction to Modern Network Synthesis’,* Wiley Eastern 1994.
5	S.P. Ghosh and A.K. Chakraborty, ‘*Network Analysis and Synthesis’,* McGraw Hill, 1st edition, 2009.

ELECTRONIC DEVICES LAB

PC 451 EC

Instruction:2 periods per week *Duration of SEE:3 hours*
CIE: 25 marks *SEE: 50 marks*
Credits: 1

Objectives:

1.Study the characteristics of PN diode
2.Learn the characteristics of BJT in CE, CB and CC configurations and Plot the characteristics of FET in CS and CD configurations
3.Observe the parameters of BJT and FET amplifiers and Design biasing circuits

Outcomes: On successful completion of the course, the students would be able to

1.Understand characteristics of Diodes
2. Plot the characteristics of BJT in different configurations.
3. Record the parameters of BJT and FET amplifiers.
4. Understand biasing techniques of BJT.
5. Use the SPICE software for simulating electronic circuits.

List of Experiments

1. V-I Characteristics of Silicon and Germanium diodes and measurement of static and dynamic resistances.
2. Zener diode Characteristics and its application as voltage regulator.
3. Design, realization and performance evaluation of half wave rectifiers without and with filters.
4. Design, realization and performance evaluation of full wave rectifiers without and with filters.
5. V-I Characteristics of BJT in CB configuration.
6. V-I Characteristics of BJT in CE configuration.
7. V-I Characteristics of JFET in CS configuration.
8. Frequency response of Common Emitter BJT amplifier.
9. Frequency response of Common Source FET amplifier.
10. BJT Biasing circuit design.
11. V-I characteristics of UJT
12. Simulate any four experiments using PSPICE

Note: A minimum of 10 experiments should be performed

Suggested Reading:

1	Paul B. Zbar, Albert P. Malvino, *Micheal A. Miller, ‘Basic Electronics, Atext–Lab Manual’*, 7th Edition, TMH 2001.

ELECTRONIC WORKSHOP LAB

PC 452 EC
Instruction:2 periods per week *Duration of SEE:3 hours*
CIE: 25 marks *SEE: 50 marks*
Credits : 1

Objectives:

1.To learn the usage of basic electronic components, equipment and meters used in electronic Laboratories and To learn practical electric AC and DC circuits
2.Verify the truth tables of combinational and sequential circuits
3.Realize combinational and sequential circuits and Design adder / subtractor

Outcomes: On successful completion of the course, the students would be able to

1.Use the basic electronic components and design circuits.
2.Verify various parameters of the circuits by applying theorems.
3.Understand the pin configuration of ICs and verify the operation of basic gates
4.Design and verify the combinational and logic circuits.
5. Use the SPICE software for simulating circuits.

List of Experiments

Part A

1. Study of all types of discrete Active & passive devices, display devices, integrated components, electro mechanical components (switches, sockets, connectors etc.,) electromagnetic components (relays). Study and use of different meters (volt/ammeter, AVO/Multi meter) for the measurement of electrical parameters. Measurement of RLC components using LCR Meter.

2. Soldering and Desoldering

3. PCB design and circuit assembling

4. Study of CRO and its applications.

5. Design and Verification of Superposition and Tellegan's theorem

6. Design and Verification of Thevenin's and Maximum Power Transfer Theorem.

7. Measurement of two-port network parameters.

8. Measurement of Image impedance and Characteristics impedance.

Part B

Implement using digital ICs

9. Verification of truth tables of Logic gates and realization of Binary to Gray and Gray to Binary code converters.
10. Realization of Half adder/sub and full adder/sub using universal logic gates.
11. Realization of Full adder/Sub using MUX and Decoder
12. Design 2's complement Adder/subtractor using IC 74283 and verify experimentally.
13. Verification of truth tables of Flip Flops and Flip flop conversions form one form to the other.

Note: A minimum of 6 experiments in Part-A and 4 experiments in Part-B should be performed. Thestudents may use any commercial / open source SPICE programs available like MULTISIM, PSPICE, TINA, LAB VIEW for simulation.

Suggested Reading:

1	Paul B. Zbar, Albert P. Malvino, *Michael A. Miller, 'Basic Electronics, A Text–Lab Manual',* 7th Edition, TMH 2001.
2	Paul Tobin, '*PSPICE for Circuit Theory and Electronic Devices',* Morgan & Claypool publishers, 1st ed., 2007.
3	Charles H. Roth,'*Fundamentals of Logic Design'*- Cengage Learning, 5th, Edition, 2004.

For the academic years 2020-2024

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV- Semester
(ELECTRONICS AND COMMUNICATION ENGINEERING)

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact	CIE	SEE	Duration in	
Theory Course										
1	ES 305 EC	Signals and Systems	3	1	-	4	30	70	3	4
2	PC 403 EC	Analog Electronic Circuits	3	-	-	3	30	70	3	3
3	PC 404 EC	Computer Organization and Architecture	3	-	-	3	30	70	3	3
4	PC 405 EC	Electromagnetic Wave Theory and Transmission Line	3	-	-	3	30	70	3	3
5	PC 406 EC	Pulse and Linear Integrated Circuits	3	-	-	3	30	70	3	3
6	PC 407 EC	Electronic Measurements and Instrumentation	3	-	-	3	30	70	3	3
Practical/Laboratory Course										
7	PC 453 EC	Analog Electronic Circuits Lab	-	-	2	2	25	50	3	1
8	PC 454 EC	Pulse and Linear Integrated Circuits Lab	-	-	2	2	25	50	3	1
Total			**18**	**1**	**4**	**23**	**230**	**520**	**24**	**21**

PC: Professional Course **ES:** Engineering Science

L: Lecture **T:** Tutorial **P:** Practical **D:** Drawing
CIE: Continuous Internal Evaluation **SEE:** Semester End Examination (Univ. Exam)

EC: Electronics and Communication Engineering

Note:

1. Each contact hour is a Clock Hour
2. The duration of the practical class is two clock hours, however it can be extended wherever necessary, to enable the student to complete the experiment

For the academic years 2020-2024

SIGNALS AND SYSTEMS

ES 305 EC

Instruction: 3+ 1 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits :4

Objectives:

1. Analyze basic concepts related to continuous time signals and systems, mathematical representation of periodic signals. Familiarize with basic operations on signals and mathematical representation of a periodic signals using Fourier and Laplace transform.
2. Analyze basic concepts related to discrete time signals and systems, mathematical representation discrete time signals.
3. Describe the concept of Z- Transform and its properties and illustrate their applications to analyze systems. Define convolution, correlation operations on continuous and discrete time signals

Outcomes: On successful completion of the course, the students would be able to

1. Define and differentiate types of signals and systems in continuous and discrete time
2. Apply the properties of Fourier transform for continuous time signals
3. Relate Laplace transforms to solve differential equations and to determine the response of the Continuous Time Linear Time Invariant Systems to known inputs.
4. Apply Z-transforms for discrete time signals to solve Difference equations.
5. Obtain Linear Convolution and Correlation of discrete time signals with graphical representation

UNIT – I
Definitions and classifications: Classification of signals. Elementary continuous time signals, Basic operations on continuous-time signals. ***classification of continuous-time systems:***continuous time & discrete time systems, lumped-parameter & distributed –parameter systems, static & dynamic systems, causal & non-causal systems, Time-invariant & time-variant systems, stable & unstable systems
UNIT – II
Representation of Continuous-time signals: Analogy between vectors and signals, orthogonality and completeness. ***Fourier series Analysis of Continuous-time signals*****:** Fourier series – Existence of Fourier series, Trigonometric and Exponential Fourier series, computational formulae, symmetry conditions, complex Fourier spectrum.
UNIT – III
Continuous-time Fourier Transform (FT)*:* The direct and inverse FT, existence of FT, Properties of FT, FT of standard signals , properties of FT, The Frequency Spectrum. ***Linear Convolution of continuous time signals***: Graphical interpretation, properties of convolution, Correlation between continuous-time signals: Auto and Cross correlation, graphical interpretation, properties of correlation.

***Laplace Transform (LT) Analysis of signals and systems*:** The direct LT, Region of convergence, existence of LT, properties of LT. The inverse LT, Solution of differential equations, system transfer function.
UNIT – IV
Discrete-time signals and systems**:* Sampling, Classification of discrete-time signals, Basic operations on discrete time signals, Classification of discrete time systems, properties of systems. ***Linear Convolution of discrete time signals*:** Graphical interpretation, properties of discrete convolution ***Fourier analysis of discrete-time signals:Discrete-time Fourier transform (DTFT), properties of DTFT, Transfer function, Discrete Fourier transform properties of DFT
UNIT – V
***Z-Transform analysis of signals & systems*:** The direct Z transform, Region of convergence, Z-plane and S-plane correspondence. Inverse Z transform, Properties of Z-transforms. Solution to linear difference equations, Linear constant coefficient systems, System transfer function.

Suggested Reading:

1	B. P. Lathi, '*Linear Systems and Signals',* Oxford University Press, 2nd Edition, 2009
2	Alan V O P Penheim, A. S. Wlisky, '*Signals and Systems',* 2nd Edition, Prentice Hall
3	Rodger E. Ziemer, William H Trenter, D. Ronald Fannin, '*Signals and Systems',* 4th Edition, Pearson 1998.
4	Douglas K. Linder, '*Introduction to Signals and Systems',* McGraw Hill, 1999
5	P. Ramesh babu, R Ananada Natarajan, '*Signals and Systems',* SCITECH, 3rd edition 2009..

ANALOG ELECTRONIC CIRCUITS

PC 403 EC

Instruction: 3 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits :3

Objectives:

1.Analyse frequency response of Amplifiers in different frequency ranges and Familiarize with concept and effect of negative feedback
2.Study positive feedback and Design different types of oscillators
3.Design Power Amplifiers and calculate their efficiencies and Familiarize with concept of tuned Amplifiers

Outcomes: On successful completion of the course, the students would be able to

1.Design and Analyse low frequency, mid frequency and high frequency response of small signalSingle stage and Multistage RC coupled and Transformer Amplifiers using BJT and FET.
2. Identify the type of negative feedback, Analyse and design of negative feedback amplifiers.
3.Design Audio Frequency and Radio Frequency oscillators
4.Distinguish between the classes of Power Amplifiers and their design considerations
5. Compare the performance of single and double tuned amplifiers

UNIT – I
Small Signal Amplifiers:Classification of amplifiers, mid-frequency, Low-frequency and high frequencyanalysis of single and multistage RC coupled amplifier with BJT and FET. Analysis of transformer coupled amplifier in mid frequency, Low frequency and high frequency regions with BJT.
UNIT – II
Feedback Amplifiers:The feedback concept, General characteristics of negative feedback amplifier,Effect of negative feedback on input and output impedances, Voltage and current, series and shunt feedbacks. Stability considerations, Local Versus global feedback
UNIT – III
Oscillators: Positive feedback and conditions for sinusoidal oscillations, RC oscillators, LC oscillators,Crystal oscillator, Amplitude and frequency stability of oscillator. ***Regulators***: Transistorized series and shunt regulators
UNIT – IV
Large Signal Amplifiers:BJT as large signal audio amplifiers, Classes of operation, Harmonic distortion,power dissipation, efficiency calculations. Design considerations of

transformer coupled and transform less push-pull audio power amplifiers under Class-A. Class-B, Class D and Class-AB operations
UNIT – V
RF Voltage Amplifiers**:** General consideration, Analysis and design of single tuned and double tunedamplifiers with BJT, Selectivity, gain and bandwidth. Comparison of multistage, single tuned amplifiers and double tuned amplifiers. The problem of stability in RF amplifiers, neutralization & uni-laterisation, introduction to staggered tuned amplifiers.

Suggested Reading:

1	Jacob Millman, Christos C. Halkias, and Satyabrata Jit, '*Electronic Devices and Circuits*', 3rd ed., McGraw Hill Education, 2010.
2	David A. Bell, '*Electronic Devices and Circuits'*, 5th ed., Oxford University Press, 2009.
3	S Salivahanan, N Kumar, and A Vallavaraj, '*Electronic Devices and Circuits'*, 2nd ed., McGraw Hill Education, 2007.
4	Jacob Millman, Christos Halkias, Chetan Parikh, '*Integrated Electronics'*, 2nd ed., McGraw Hill Education (India) Private Limited, 2011.
5	Donald L Schilling & Charles Belove, '*Electronics Circuits, Discrete & Integrated'*, 3rd ed., McGraw Hill Education (India) Private Limited, 2002

COMPUTER ORGANIZATION AND ARCHITECTURE

PC 404 EC

Instruction: 3 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits : 3

Objectives:

1. Implement the fixed-point and floating-point addition, subtraction, multiplication & Division.
2. Describe the basic structure and operation of a digital computer and Discuss the different ways of communicating with I/O devices and standard I/O interfaces
3. Analyze the hierarchical memory system including cache memories and virtual memory. Understand issues affecting modern processors.

Outcomes: On successful completion of the course, the students would be able to

1. Perform mathematical operations on fixed and floating point digital data.
2. Illustrate the operation of a digital computer.
3. Understand I/O interfacing of a computer.
4. Interface microprocessor with memory devices.
5 Understand latest trends in microprocessors..

UNIT – I
***Data representation and Computer arithmetic*:** Introduction to Computer Systems, Organization andarchitecture, evolution and computer generations; Fixed point representation of numbers, digital arithmetic algorithms for Addition, Subtraction, Multiplication using Booth’s algorithm and Division using restoring and non-restoring algorithms. Floating point representation with IEEE standards and its arithmetic operations.
UNIT – II
***Basic Computer organization and Design*:** Instruction codes, stored program organization, computerregisters and common bus system, computer instructions, timing and control, instruction cycle: Fetch and Decode, Register reference instructions; Memory reference instructions. Input, output and Interrupt: configuration, instructions, Program interrupt, Interrupt cycle, Micro programmed Control organization, address sequencing, micro instruction format and micro program sequencer.
UNIT – III
***Central Processing Unit*:** General register organization, stack organization, instruction formats, addressingmodes, Data transfer and manipulation, Program control. CISC and RISC: features and comparison. Pipeline and vector Processing, Parallel Processing, Pipelining, Instruction Pipeline, Basics of vector processing and Array Processors
UNIT – IV
***Input-output Organization*:** I/O interface. I/O Bus and interface modules, I/O versus Memory Bus.Asynchronous data transfer: Strobe control, Handshaking, Asynchronous serial transfer. Modes of Transfer: Programmed I/O, Interrupt driven I/O, Priority interrupt; Daisy chaining,

Parallel Priority interrupt. Direct memory Access, DMA controller and transfer. Input output Processor, CPU-IOP communication, I/O channel.
UNIT – V
Memory Organization: Memory hierarchy, Primary memory, Auxiliary memory, Associative memory,Cache memory: mapping functions, Virtual memory: address mapping using pages, Memory management.

Suggested Reading:

1	Morris Mano, M., '*Computer System Architecture'*, 3/e, Pearson Education, 2005.
2	William Stallings, '*Computer Organization and Architecture: Designing for performance*', 7/e, Pearson Education, 2006.
3	John P. Hayes, '*Computer Architecture and Organization'*, 3/e, TMH, 1998.
4	Govindarajalu, '*Computer Architecture and Organization'*, TMH.
5	Hebbar, '*Computer Architecture'*, Macmillan,2008.

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

PC 405 EC

Instruction: 3 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits : 3

Objectives:

1.Analyse fundamental concepts of vector analysis, electrostatics and magneto statics law and their applications to describe the relationship between Electromagnetic Theory and circuit theory. Formulate the basic laws of static electricity and magnetism and extend them to time varying fields to define the Maxwell's equations in differential and integral form.
2.Derive the wave equations for conducting and di-electric mediums to analyse the wave propagation characteristics of Uniform Plane Waves (UPW) in normal and oblique incidences and Analyse fundamental concepts of Transmission lines and to formulate the basic relationship between distortion less transmission lines & applications.
3.To understand the concepts of RF Lines and their characteristics, Smith Chart and its applications, acquire knowledge to configure circuit elements, QWTs and HWTs and to apply the same for practical problems

Outcomes: On successful completion of the course, the students would be able to

1. Understand the different coordinate systems, vector calculus, coulombs law and gauss law for finding electric fields due to different charges and to formulate the capacitance for different capacitors.
2. Learn basic magneto-statics concepts and laws such as Biot-Savarts law and Amperes law, their application in finding magnetic field intensity, inductance and magnetic boundary conditions.
3. Distinguish between the static and time-varying fields, establish the corresponding sets ofMaxwell's Equations and Boundary Conditions, and use them for solving engineering problems.
4. Determine the Transmission Line parameters to characterize the distortions and estimate the characteristics for different lines.
5. Study the Smith Chart profile and stub matching features, and gain ability to practically use the same for solving practical problems

UNIT – I
***Electrostatics*:** Review of coordinate systems. Coulomb's Law, Electric field due to various Charge distributions and Electric flux density. Gauss's Law and its applications. Work, Potential and Energy, The dipole. Current and Current density, Laplace and Poisson's equations. Calculation of capacitance for simple configurations
UNIT – II

Magnetostatics**:** Steady magnetic - Biot-Savart's law, Ampere's law. Stoke's theorem, Magnetic flux and magnetic flux density. Scalar and vector magnetic potentials. Electric and Magnetic fields boundary conditions. Maxwell's equations for static and time varying fields.
UNIT – III
Electromagnetic Waves: Uniform plane waves in free space and in conducting medium, Polarization. Instantaneous, average and complex Power, Poynting theorem, Surface Impedence.   ***Reflection and Refraction*****:** Normal and Oblique incidence on dielectric and conducting medium.
UNIT – IV
Transmission Lines 1:   Overview of T and π networks. Two wire Transmission lines, Primary and secondary constants. Transmission Line equations. Infinite line and characteristic impedance- Open and short circuit lines and their significance. Distortion less transmission line, Concept of loading of a transmission line, Campbell's formula.
UNIT – V
Transmission Lines 2:   Impedance of a transmission line, RF and UHF lines, transmission lines as circuit elements. Properties of λ/2, λ/4 and λ/8 Lines. Reflection coefficient and VSWR. Matching: Stub matching. Smith chart and its applications

Suggested Reading:

1	Matthew N.O. Sadiku, '*Principles of Electro-magnetics'*, 6th edition, Oxford University Press, 2016.
2	William H. Hayt Jr. and John A. Buck, '*Engineering Electromagnetics'*, h edition, Tata McGraw Hill, 2006.
3	John D. Ryder, '*Networks Lines and Fields'*, 2nd edition, Pearson, 2015.
4	E.C. Jordan and K.G. Balmain, '*Electromagnetic Waves and Radiating Systems'*, 2nd edition, Pearson, 2015
5	K.D. Prasad, '*Antennas and Wave Propagation'*, Khanna Publications

For the academic years 2020-2024

PULSE AND LINEAR INTEGRATED CIRCUITS

PC 406 EC
Instruction: 3 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits : 3

Objectives:

1.Analyse the behaviour of Linear and non-linear wave shaping circuits
2. Analyse and design of Multivibrators
3.Understand the functionality of OP-AMP, 555 timer and PLL with applications to Data convertors

Outcomes: On successful completion of the course, the students would be able to

1. Construct different linear networks and analyse their response to different input signals
2. Understand, Analyse and design multi vibrators and sweep circuits using transistors.
3. Analyse DC and AC characteristics for single/Dual input Balanced/Unbalanced output configurations using BJTs and OP-AMP.
4. Distinguish various linear and nonlinear applications of OP-AMP.
5. Demonstrate the various applications of 555 Timer and analyse the operation of the D/A and A/D converters.

UNIT – I
Linear Wave Shaping: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe. **Non-Linear Wave Shaping:** Diode clippers, Transistor clippers, clipping at two independent levels, Comparators, applications of voltage comparators. Clamping operation, clamping circuit taking Source and Diode resistances into account, Clamping circuit theorem.
UNIT – II
Multivibrators: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using transistors, **Time Base Generators:** General features of a time base signal, methods of generating voltage time base waveform.
UNIT – III
Differential amplifiers: Classification, DC and AC Analysis of Single/Dual input Balanced and Unbalanced output configurations using BJTs. Level Translator. **Operational Amplifier**: OP AMP Block diagram, ideal Opamp characteristics, Opamp and its features, Opamp parameters and Measurements, Input and Output Offset voltages and currents, Slew rate, CMRR, PSRR. Frequency response and Compensation Techniques.
UNIT – IV
OPAMP Applications: Inverting and Non-Inverting Amplifiers, Integrator and differentiator,

summing amplifier, precision rectifier, Schmitt trigger and its applications. Active filters: Low pass, high pass, band pass and band stop. Log and Anti Log Amplifiers.
UNIT – V
555 Timer: Functional Diagram, Monostable, Astable and Schmitt Trigger Applications. Fixed and variable voltage regulators, PLL and its Applications. **Data Converters**: Digital-to-analog converters (DAC): Weighted resistor, inverted R-2R ladder, Analog-to-digital converters (ADC): dual slope, successive approximation, flash, Specifications.

Suggested Reading:

1	J. Millman and H. Taub, '*Pulse, Digital and Switching Waveforms'* - McGraw-Hill, 1991
2	David A. Bell, '*Solid State Pulse circuits'* - PHI, 4th Edn., 2002.
3	Ramakanth A. Gayakwad, '*Op-Amps and Linear Integrated Circuits'* Pearson,2018, 4th edition
4	D.Roy Chowdhury, Shail B.Jain, '*Linear Integrated Circuits'*, 4/e, New Age International (P) Ltd., 2008.

For the academic years 2020-2024

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

PC 407 EC

Instruction: 3 periods per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*
Credits : 3

Objectives:

1.	Understand the different standards of measurements.
2.	Study different types of transducers, Sensors and their measuring techniques
3.	Learn about various types of biomedical instrumentation equipment.

Outcomes: On successful completion of the course, the students would be able to

1.	Describe characteristic of an instrument and state different Standards of measurements
2.	Identify and explain different types of Transducers
3.	Draw and Interpret types of transducers.
4.	Design and analyse the digital voltmeters and Prioritize the instruments.
5.	Identify and classify types of Biomedical instruments.

UNIT – I
Electronic Measurement fundamentals: Accuracy, Precision, Resolution and Sensitivity. Errors and their types. Standards of measurement, classification of standards, IEEE standards.
UNIT – II
Transducers: Classification, factors for selection of a transducer, transducers for measurement of velocity, acceleration. Passive electrical transducers- Strain gauges and strain measurement, LVDT and displacement measurement, capacitive transducer and thickness measurement. Active electrical transducers: Piezo electric, photo conductive, photo voltaic and photo emissive transducers
UNIT – III
Electronic Sensors: Characteristics of sound, pressure, power and loudness measurement. Microphones and their types. Temperature measurement, resistance wire thermometers, semiconductor thermometers and thermo couples
UNIT – IV
Measuring instruments: Block diagram, specification and design considerations of different types of DVMs. Spectrum analysers. The IEEE488 or GPIB Interface and protocol. Delayed time base oscilloscope and Digital storage oscilloscope. Introduction to virtual instrumentation, SCADA. Data acquisition system block diagram
UNIT – V
Biomedical Instrumentation: Human physiological systems and related concepts. Bio-potential electrodes Bio-potential recorders – ECG, EEG, EMG, X- ray machines and CT scanners, magnetic resonance and

imaging systems, Ultrasonic Imaging systems

Suggested Reading:

1.	Albert D. Helfric, and William D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 2010.
2.	H S Kalsi, "Electronic Instrumentation", 3/e, TMH, 2011.
3.	Robert A Witte, "Electronic Test Instruments: Analog and Digital Measurements", 2/e, 2002
4.	Nakra B.C, and Chaudhry K.K., "Instrumentation, Measurement and Analysis", TMH, 2004
5.	Khandpur. R.S., "Handbook of Bio-Medical Instrumentation", TMH, 2003

ANALOG ELECTRONIC CIRCUITS LAB

PC 453 EC
Instruction:2 periods per week *Duration of SEE: 3 hours*
CIE: 25 marks *SEE: 50 marks*
Credits : 1

Objectives:

1.Design and analyse BJT, FET amplifiers, multivibrators
2.Analyse Oscillator circuits
3.Understand Op-Amp. Applications and filter circuits

Outcomes: On successful completion of the course, the students would be able to

1.Calculate gain and bandwidth of BJT, FET
2.Study multivibrator circuits
3. Study oscillator circuits.
4.Demonstrate filter circuits
5. Demonstrate power amplifier and Op-Amp. Circuits

List of Experiments

1. Two Stage RC Coupled CE BJT amplifier.
2. Two Stage RC Coupled CS FET amplifier.
3. Voltage Series Feedback Amplifier.
4. Voltage Shunt Feedback Amplifier.
5. Current series feedback Amplifier
6. RC Phase Shift Oscillator.
7. Hartley & Colpitt Oscillators
8. Design of Class A and Class B Power amplifiers.
9. Constant-k low pass & high pass filters.
10. m-Derived low pass & high pass filters.
11. Series and Shunt Voltage Regulators
12. RF Tuned Amplifier

SPICE:

13. Two Stage RC Coupled CS FET amplifier.
14. Voltage Series Feedback Amplifier
15. Current Shunt Feedback Amplifier

Note: A minimum of 10 experiments should be performed. It is mandatory to simulate any three experiments using SPICE.

Suggested Reading:

1	Paul B. Zbar, Albert P. Malvino, *Micheal A. 'Miller, Basic Electronics, A text–Lab Manual'*, 7thEdition, TMH 2001

For the academic years 2020-2024

For the academic years 2020-2024

PULSE AND LINEAR INTEGRATED CIRCUITS LAB

PC 454 EC

Instruction:2 periods per week *Duration of SEE: 3 hours*
CIE: 25 marks *SEE: 50 marks*
Credits: 1

Objectives:

1.To implement high pass and low pass circuit, clipping and clamping circuits and study it`s performance
2.To design and test bi-stable, mono-stable multi-vibrators
3.To study the characteristics of a Schmitt trigger and to build sweep circuits and study it`s performance

Outcomes: On successful completion of the course, the students would be able to

1. Design and analyse linear and non-linear wave shaping circuits.
2. Design and analyse clipping and clamping circuits.
3. Design and analyse multivibrator circuits.
4.Design and analyse Schmitt trigger circuit
5. Develop various applications of OP-AMP

List of Experiments

1. Low Pass and High Pass RC Circuits
2. Two level Clipping Circuit
3. Clamping Circuit
4. Transistor Switching Times
5. Collector Coupled Bistable Multivibrators
6. Collector Coupled Monstable Multivibrators
7. Collector Coupled Astable Multivibrators
8. Schmitt Trigger Circuit
9. Measurement of OPAMP Parameters
10. Inverting and Non-inverting OPAMP Voltage follower
11. Integrator and Differentiator using OPAMP
12. Active filters
13. Astable and Mono stable multi vibrator using NE555 IC
14. Astable and Monostable multivibrator using OPAMP
15. Miller Sweep Circuit
16. UJT Relaxation Oscillator

Note: A minimum of 10 experiments should be performed

Suggested Reading:

1	Robert Boylestad and Louis Nashelsky, 'Electronic Devices and Circuit *Theory'*, 5th Edition, Prentice-Hall of India Private Limited, New Delhi, 1995.
2	David A. Bell, Laboratory Manual for '*Electronic Devices and Circuits'*, 4th Edition, Prentice-Hall of India Private Limited, New Delhi, 2004