FACULTY OF ENGINEERING

Scheme of Instruction & Examination

(AICTE Model Curriculum for the Academic Year 2020-2021)

and

Syllabi

B.E. III and IV Semester

of

Four Year Degree Programme

in

Electronics and Communication Engineering

(With effect from the academic year 2020– 2021)

(As approved in the faculty meeting held on 25-06-2019)

Issued by

Dean, Faculty of Engineering

Osmania University, Hyderabad – 500 007

2020

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 Hrs/Wk	CIE	SEE	Duration in Hrs	
Theory Course										
1	BS201EG	Effective Technical Communication in English	3	-	-	3	30	70	3	3
2	HS202CM	Finance and Accounting	3	-	-	3	30	70	3	3
3	ES 215EC	Digital Electronics	3	1	-	3	30	70	3	4
4	PC201EC	Probability Theory and Stochastic Processes	3	1	-	3	30	70	3	4
5	PC202EC	Electronic Devices	3	1	-	3	30	70	3	4
6	PC203EC	Network Theory	3	1	-	3	30	70	3	4
Practical/Laboratory Course										
7	PC251EC	Electronic Devices Lab	-	-	2	2	25	50	2	1
8	PC252EC	Electronic Workshop	-	-	2	2	25	50	2	1
Total			**18**	**4**	**4**	**22**	**230**	**520**	**22**	**24**

PC: Professional Course **MC**: Mandatory Course **L**: Lecture **T:** Tutorial
P: Practical **D**: Drawing **G**: Grade (E/VG/G/S/U)
CIE: Continuous Internal Evaluation **SEE**: Semester End Examination (Univ. Exam)

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

Course Code	Course Title						Core/Elective
HS201EG	**Effective Technical Communication in English**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	-	-	-	30	70	3

Course Objectives: To Expose the students to

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

Course Outcome: 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) to verbal (writing), Verbal (written) to non-verbal, Important aspects of oral and visual presentations.

Suggested Readings:

1. Raman, Meenakshi & Sharma, Sangeeta. (2015). *Technical Communication: Principles and Practice*(3rd ed.). New Delhi.
2. Rizvi,Ashraf, M. (2017).*Effective Technical Communication*(2nd ed.).Tata McGraw Hill Education. New Delhi.
3. Sharma, R. C., & Mohan, Krishna. (2017). *Business Correspondence and Report Writing: A Practical Approach to Business & Technical Communication* (4th ed.). Tata McGraw Hill Education. New Delhi.
4. Tyagi, Kavita &Misra, Padma. (2011). *Advanced Technical Communication*. New Delhi, PHI Learning.

Course Code	Course Title						Core/Elective
HS202CM	**Finance and Accounting**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The objectives of the course is

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

Course Outcomes

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 Trial Balance-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 and issuers- 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 Value of 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 Readings:

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

Course Code	Course Title						Core/Elective
ES216EC	**Digital Electronics**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	3	1	-	-	30	70	4

Course Objectives: To Expose the students to

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.

Course Outcome: 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 VHDL 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 logic circuits – 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. Code converters, BCD to 7-segment converter, Arithmetic comparator circuits.

UNIT – III

Design of combinational circuits using Programmable Logic Devices (PLDs): General structure of a Programmable 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, T Flip-flop, JK Flip-flop, Excitation tables. Registers and Counters

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 Readings:

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.

Course Code	Course Title						Core/Elective
PC201EC	**Probability Theory and Stochastic processes**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**1**	**-**	**-**	**30**	**70**	**4**

Course 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 learn two Random variable characteristic functions of different variables using their density functions
4. To understand elementary concepts of the Stochastic Processes and their temporal characteristics
5. To understand elementary concepts of the Stochastic Processes and their Spectral characteristics

Course Outcomes

At the end of this course the students will 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: Probability and Random Variable

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 READINGS:

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 Processes*, 4th edition, McGraw Hill, 2006.
3. Peyton Z. Peebles, *Probability, Random Variables & Random Signal Principles*, 4th edition, Tata McGraw Hill, 2001.

Course Code	Course Title					Core/Elective
PC202EC	**Electronic Devices**					**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**1**	**-**	**-**	**30**	**70**	**4**

Course Objectives

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

Course Outcomes

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, Diode current 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, performance characteristics 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 Solar cells.

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 of JFET, 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 Readings:

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.

Course Code	Course Title						Core/Elective
PC203EC	**Network Theory**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**1**	**-**	**-**	**30**	**70**	**4**

Course 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.
4. Design concepts of different filters.
5. Design concepts of network synthesis.

Course Outcomes

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 of symmetrical 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 pass and 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, impedance matching 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-C Immitance 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 Readings:

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.

Course Code	Course Title				Core/Elective		
PC251EC	**Electronic Devices Lab**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ED PC221EC	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives

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

Course Outcomes

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 Readings:

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

Course Code	Course Title					Core/Elective
PC252EC	**Electronic Workshop Lab**					**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives

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

Course Outcomes

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.

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. The students may use any commercial / open source SPICE programs available like MULTISIM, PSPICE, TINA, LAB VIEW for simulation.

Suggesting Readings:

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. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.

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 Hrs/Wk	CIE	SEE	Duration in Hrs	
Theory Course										
1	ES216EC	Signals and Systems	3	-	-	3	30	70	3	3
2	PC231EC	Analog Electronic Circuits	3	1	-	4	30	70	3	4
3	PC232EC	Electromagnetic Theory and Transmission Lines	3	1	-	4	30	70	3	4
4	PC233EC	Pulse and Digital Circuits	3	1	-	4	30	70	3	4
5	PC234EC	Computer Organization and Architecture	3	-	-	3	30	70	3	3
6	MC771EG	Human Values and Professional Ethics	2	-	-	3	30	70	3	0
Practical/Laboratory Course										
7	PC261EC	Analog Electronic Circuits Lab	-	-	2	2	25	50	3	1
8	PC262EC	Pulse and Digital Circuits Lab	-	-	2	2	25	50	3	1
Total			**17**	**3**	**4**	**24**	**230**	**520**	**24**	**20**

HS: Humanities and Social Sciences BS: Basic Science ES: Engineering Science
MC: Mandatory Course PC: Professional Core
L: Lecture T: Tutorial P: Practical D: Drawing
CIE: Continuous Internal Evaluation SEE: Semester End Evaluation (Univ. Exam)
PY: Philosophy, BZ: Biology/ Life Sciences, CE: Civil Engineering,
MP: Mechanical / Production Engineering, 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

Course Code	Course Title						Core/Elective
ES216EC	**Signals and Systems**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	30	70	3

Course Objectives:

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

Course Outcomes

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

Course Code	Course Title				Core/Elective		
PC231EC	**Analog Electronic Circuits**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	-1	**-**	**-**	**30**	**70**	**4**

Course Objectives

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

Course Outcomes

1. Design and Analyse low frequency, mid frequency and high frequency response of small signal single 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

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UNIT-I

Small Signal Amplifiers: Classification of amplifiers, mid-frequency, Low-frequency and high frequency analysis 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 tuned amplifiers 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 Readings:

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.

Course Code	Course Title						Core/Elective
PC232EC	**Electromagnetic Theory and Transmission Lines**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**1**	**-**	**-**	**30**	**70**	**4**

Course 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
2. 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.
3. 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
4. Analyse fundamental concepts of Transmission lines and to formulate the basic relationship between distortion less transmission lines & applications.
5. 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.

Course Outcomes

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 of Maxwell'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 Readings:

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*, 7th 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.

Course Code	CourseTitle				Core/Elective		
PC233EC	**PULSE AND DIGITAL CIRCUITS**				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ED	3	1	-	-	30	70	4

Course Objectives:

1. To Introduce the students the wave shaping circuits, Switching characteristics of diode and transistor
2. Analyze different types of Multi vibrators and their design procedures.
3. Understand the operation of Sampling Gates
4. Design NAND and NOR gates using various logic families.

Course Outcome:

1. understand and analyze the responses of first order RC low pass and high pass filters for standard inputs.
2. understand the transfer characteristics of clipping circuits and the response of clamping circuits for sinusoidal and square wave signals.
3. understand the operation, analysis and design of multivibrators using BJTs
4. Analyze different types of sampling gate circuits
5. understand the operation of TTL, ECL,NMOS and CMOS logic families

UNIT I

LINEAR WAVESHAPING- 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, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT II

NON-LINEAR WAVE SHAPING- Diode clippers, Transistor clippers, clipping at two independent levels, Comparators, applications of voltage comparators, clamping operation, clamping circuits taking source and diode resistances into account clamping circuit theorem, practical clamping circuits, the effect of diode characteristics on clamping voltage

Switching Characteristics OF Diodes and Transistors

UNIT III

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 time base waveform

UNIT IV

SAMPLING GATES- Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Reduction of the pedestal in gate circuits, Applications of sampling gates.

UNIT V

LOGIC FAMILIES: AND, OR gates using Diodes and Transistors Characteristics of Logic families,ECL, TTL, and CMOS Logic families and its comparison. TTL and CMOS Interfacing.

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. Anand Kumar A, “Pulse and Digital Circuits”, Prentice-Hall of India private Limited, New Delhi, 2007.

Course Code	Course Title						Core/Elective
PC234EC	**Computer Organisation and Architecture**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

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

Course Outcomes

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 and architecture, 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, computer registers 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, addressing modes, 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 Readings:

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

Course Code	CourseTitle				Core/Elective		
MC771EG	**Human Values and Professional Ethics**				Mandatory		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	**T**	**D**	**P**			
-	**2**	**-**	**-**	**-**	**30**	**70**	-

Course Objectives: Student has understand the

1. To develop a critical ability to distinguish between essence and form, or between what is of value and what is superficial to life.
2. To move from discrimination to commitment. It is to create an ability to act on any discrimination in a given situation.
3. It encourage students to discover what they consider valuable, after learning the course, they should be able to discriminate between valuable and superficial in real situation in their life.

Course Outcome: At the end of the course, the students will be able to

1. It ensures students sustained happiness through identifying the essential of human values and skills.
2. It facilitates a correct understanding between profession and happiness.
3. It help students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
4. Ability to develop appropriate technologies and management patterns to create harmony in professional and personal life.

UNIT - I

Course Introduction - Need, basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self-Exploration - what is it? - its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self-exploration. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities - the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT - II

Understanding Harmony in the Human Being - Harmony in Myself!: Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

UNIT - III

Understanding Harmony in the Family and Society- Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of justice and program for its fulfillment; Trust and Respect as the foundational values of relationship. Difference between intention and competence. Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family)

UNIT - IV

Understanding Harmony in the nature and Existence - Whole existence as Coexistence: Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT - V

Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.

Suggested Readings:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
3. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
4. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak. Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986
5. Smriti Shristava, "Human Values and Professional Ethics", Katson Publications,2007

Course Code	Course Title				Core/Elective		
PC261EC	**Analog Electronic Circuit Lab**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
AEC PC231EC	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives

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

Course Outcomes

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. Hartly & 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 Readings:

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

Course Code	Course Title						Core/Elective
PC262EC	**Pulse and Digital Circuits Lab**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
PDC **PC233EC**	**-**	**-**	**-**	**2**	**25**	**50**	**1**

Course Objectives

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

Course Outcomes

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. Verify the characterstics of TTL & CMOS circuits

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. Miller Sweep Circuit
10. Sampling Gates
11. UJT Relaxation Oscillator
12. Characteristics of TTL and CMOS logic circuits

Note: A minimum of 10 experiments should be performed

Suggested Readings:

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.