GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE

(AUTONOMOUS)

NELLORE–524317(A.P) INDIA

B.TECH

IN

ELECTRONICS & COMMUNICATION ENGINEERING

COURSE STRUCTURE AND SYLLABI

UNDER

RG 22 REGULATIONS

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE

AUTONOMOUS

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

(ACCREDITATED BY NBA)

DEPARTMENT VISION

Achieving academic excellence in Electronics and Communication Engineering by shaping next-generation technocrats keeping pace with socio-economic needs.

DEPARTMENT MISSION

M1: Adopting outcome oriented teaching -learning processes to provide comprehensive knowledge in the application of Electronics and Communication Engineering principles.

M2: Striving for implementation of advanced technology to cater to industrial demands and societal concerns.

M3: Producing highly skilled and responsible professionals with robust ethical values.

M4: Integrating technical capabilities, life skills and entrepreneurship abilities to produce dynamic contributors to social advancement.

Program Educational Objectives (PEOs)

PEO-1: Demonstrating a deep passion for continuous learning through technical expertise for a promising career.

PEO-2: Exhibiting a strong commitment to serving the society with adherence to professional ethics.

PEO-3: Managing resources efficiently as competent engineers through effective social interaction.

PEO-4: Engaging in advanced learning and contributing to technological innovations.

Program Outcomes

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	**Ethic**s: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1 Design and develop electronic circuits and communication systems, applying the principles of signal, image processing, VLSI, Embedded and wireless applications relevant to industry and society.

PSO2 Adopting software tools like Matlab, Xilinx, Microwind, NS-2 to develop intelligent systems to offer customized solutions.

Semester - 3 (Theory-7, Lab-3, MC-1)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	BSC	22A0015T	Complex Variables & Numerical Methods	3	0	0	3
2	BSC	22A0020T	Probability Theory and Stochastic Processes	3	0	0	3
3	PCC	22A0404T	Signals and Systems	3	0	0	3
4	PCC	22A0405T	Digital Logic Design	3	0	0	3
5	HSC	22A0021T	Universal Human Values	3	0	0	3
6	PCC	22A0406T	Analog Circuits	3	0	0	3
7	PCC (Lab)	22A0407P	Simulation Lab	0	0	3	1.5
8	PCC (Lab)	22A0408P	Digital Logic Design Lab	0	0	3	1.5
9	PCC (Lab)	22A0409P	Analog Circuits Lab	0	0	3	1.5
10	SC	22A3205	**Skill Oriented Course:** Python Programming	1	0	2	2
11	MC	22A0029M	**Mandatory Course:** Constitution of India	2	0	0	0
			Total credits				**24.5**

Category	**Credits**
Basic Science Course (BSC)	6
Professional Core Courses (PCC)	13.5
Humanities and Social Science Course (HSC)	3
Skill Oriented Course (SC)	2
Total	24.5

COMPLEX VARIABLES AND NUMERICAL METHODS
(Common to EEE, ECE, ME)

Course Code	L: T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0015T	3: 0:0:0	3	CIE: 30 SEE:70	3Hours	BSC

Course Objectives:

This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables, various numerical methods for interpolating the polynomials, evaluation of integral equations and solution of differential equations.

Syllabus **Total Hours:45**

Unit - I	Analytic Functions And Conformal Mapping	9 Hrs

Differentiation, Analytic functions, Cauchy-Riemann equations (both Cartesian and polar), Harmonic functions, and Harmonic conjugate, Potential functions.

Unit - II	Complex Integration	9 Hrs

Line integrals, Cauchy's theorem (without proof), Cauchy's integral formula (without proof), Generalized Cauchy's integral formula (without proof), Complex Power Series: Taylor's series and Laurent's series (without proof), zeros of an analytic functions, Singularities: Types of singularities, pole of order.

Unit - III	Residue Theorem	9 Hrs

Residues and evaluation of residues at poles, Cauchy's Residue theorem (without proof), Evaluation ofintegrals using residue theorem, Evaluation of improper and real integrals of the type:

(i) $\int_c^{2} f(\cos \sin)\, d$ (ii) $f(x)\, dx$

Unit - IV	Interpolation-Numerical Differentiation & Integration	9 Hrs

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Numerical Differentiation & Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule

Unit - V	Numerical Solution of Ordinary Differential Equations	9 Hrs

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method ofsuccessive Approximations-Modified Euler's Method-Runge-Kutta Methods.

Textbooks:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics Volume III by T.K.V. Iyengar, B.Krishna Gandhi,S.Ranganatham and M.V.S.S.N. Prasad, S. Chand Publications.
3. Introductory Methods of Numerical Analysis by S. S. Sastry, PHI Learning Pvt. Ltd., New

References:

1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

Course Outcomes (CO):

On completion of this course, student will be able to:

CO-1: Understand functions of Complex variable and its properties,

CO-2: Understand analyticity & conformal mappings of complex functions.

CO-3: Understand the integration of complex functions; apply Cauchy's integral theorem and Cauchy's integral formula, singularities of complex functions.

CO-4: Evaluate improper integrals of complex functions using Residue theorem.

CO-5: Derive interpolating polynomials using interpolation formulae and evaluate the differentiation and integration numerically.

CO-6: Solve differential and integral equations numerically.

PROBABILITY THEORY AND STOCHASTIC PROCESSES					
Course Code	**L: T:P**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0020T	**3:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**BSC**

Course Objectives:

- This gives basic understanding of random signals and processes signal
- To understand the principles of random signals and systems in Communications andSignal Processing areas.
- To know the Spectral and temporal characteristics of Random Processes.
- To Learn the Basic concepts of Noise sources.

Syllabus	**Total Hours:48**
Unit –I	**10 Hrs**

Probability: Probability Introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events, Problem Solving.

Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties, Problem Solving.

Unit –II	**10 Hrs**

Operations on Single Random Variable: Introduction, Expectation of a random variable, moments-moments about the origin, Central moments, Variance and Skew, Chebyshev's inequality, moment generating function, characteristic function, transformations of random variable, Problem Solving.

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected), Unequal Distribution, Equal Distributions, Problem Solving.

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties of Gaussian random variables, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables, Problem Solving.

Unit –III	**10 Hrs**

Random Processes-Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, N-Order and Strict-Sense Stationarity. Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process, Problem Solving.

Unit –IV	**9 Hrs**

Random Processes-Spectral Characteristics: The Power Density Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum and its Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function, Problem Solving.

Unit –V	9 Hrs

Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band Limited and Narrowband Processes, Properties, Problem Solving.

Text Books:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001.
2. Principles of Communication systems by Taub and Schilling (TMH), 2008.

References:

1. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002.
2. Simon Haykin, "Communication Systems", 3rd Edition, Wiley, 2010.
3. Henry Stark and John W.Woods, "Probability and Random Processes with Application to Signal Processing," 3rd Edition, Pearson Education, 2002.
4. George R. Cooper, Clave D. MC Gillem, "Probability Methods of Signal and System Analysis," 3rd Edition, Oxford, 1999.

Course Outcomes:

After the completion of the course students will able to:

CO-1: Understanding the concepts of Probability, Random Variables, Random Processes and their characteristics learn how to deal with multiple random variables, conditional probability, joint distribution and statistical independence.

CO-2: Formulate and solve the engineering problems involving random variables and random processes.

CO-3: Analyze various probability density functions of random variables.

CO-4: Derive the response of linear system for Gaussian noise and random signals as inputs.

CO-5: Understand and analyze continuous and discrete-time random processes.

CO-6: Evaluate the single and multiple random variable concepts to expectation, variance and moments.

SIGNALS AND SYSTEMS					
Course Code	**L: T:P**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0404T	**3:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PCC**
Pre-requisite		**Mathematics - I**			

Course Objectives:

- To introduce students to the basic idea of signal and system analysis and its characterization in time and frequency domains.
- To present Fourier tools through the analogy between vectors and signals.
- To teach concept of sampling and reconstruction of signals.
- To analyze characteristics of linear systems in time and frequency domains.
- To understand Laplace and z-transforms as mathematical tool to analyze continuous anddiscrete-time signals and systems.

UNIT - I	Signals, Systems and Fourier Series	10 Hrs

Signals & Systems: Basic definitions and classification of Signals and Systems (Continuous time and discrete time), operations on signals, Important sets & symbols, Analogy between vectors and signals-Orthogonality, mean square error.

Fourier series (FS): Trigonometric & Exponential, Properties of Fourier series, concept of discrete spectrum, Illustrative Problems.d

UNIT - II	CTFT and DTFT	10 Hrs

Continuous Time Fourier Transform (CTFT): Definition, Computation and properties of Fourier Transform for different types of signals and systems, Inverse Fourier transform. Statement and proof of sampling theorem of low pass signals, Illustrative Problems.

Discrete Time Fourier Transform (DTFT): Definition, Computation and properties of Discrete TimeFourier transform for different types of signals and systems.

UNIT - III	Laplace Transform	10 Hrs

Laplace Transform (LT): Definition, ROC, Properties, Inverse Laplace transforms, the S-plane and BIBO stability, Transfer functions, System Response to standard signals, Solution of differential equations with initial conditions.

UNIT - IV	Signal Transmission through LTI systems	9 Hrs

Signal Transmission through Linear Systems: Linear system, impulse response, Response of a linear system for different input signals, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time, Energy and Power spectral densities, Illustrative Problems.

UNIT - V	Z-Transform	9 Hrs

Z–Transform (ZT): Definition, ROC, Properties, Poles and Zeros in Z-plane, The inverse Z-Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions. Illustrative Problems.

Text Books:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", 2nd Edition, PHI,2009.
2. Simon Haykin and Van Veen, "Signals & Systems", 2nd Edition, Wiley, 2005

Reference Books:

1. BP Lathi, "Principles of Linear Systems and Signals", 2nd Edition, Oxford University Press,015.
2. Matthew Sadiku and Warsame H. Ali, "Signals and Systems A primer with MATLAB", CRCPress, 2016.
3. Hwei Hsu, "Schaum's Outline of Signals and Systems", 4thEdition, TMH, 2019.

Course Outcomes (CO):

After the completion of the course students will able to:

CO-1: Understand the mathematical description and representation of continuous-time and discrete-timesignals and systems.

CO-2: Also understand the concepts of various transform techniques.

CO-3: Apply sampling theorem to convert continuous-time signals to discrete-time signals.

CO-4: Reconstruct back, different transform techniques to solve signals and system related problems

CO-5: Analyze the frequency spectra of various continuous-time and discrete-time signals usingdifferent transform methods.

CO-6: Classify the systems based on their properties and determine the response of them.

DIGITAL LOGIC DESIGN					
Course Code	**L: T:P**	**Credits**	**Exam.Marks**	**Exam Duration**	**Course Type**
22A0405T	**3:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PCC**

Course Objectives:

- To understand the Arithmetic, binary codes and theory of Boolean algebra.
- To study representation of switching functions using Boolean algebra expressions andtheir minimization techniques.
- To study the combinational logic design of various logic circuits.
- To study the sequential logic circuits design both in synchronous and Asynchronousmodes.
- To be able to understand Logic and switching devices, their minimization techniques and their realizations.
- To study some of the programmable logic devices and their use in realization of switching functions.

Syllabus

Unit –I	**10 Hrs**

Basic Concepts: Code Conversions, Arithmetic operations, subtraction using 1's and 2's compliment, Binary coded decimal, Excess-3 Codes, Gray Codes, Binary weighted code, Alphanumeric codes, Problem Solving.

Unit –II	**10 Hrs**

Boolean Algebra: Introduction to Boolean Algebra – Axioms and Laws of Boolean Algebra – Boolean functions – Canonical and Standard Forms. Gate – Level Minimization: Introduction – Two, Three, Four Variable K-map's – Don't Care Conditions – NAND and NOR implementation, Problem Solving.

Unit –III	**10 Hrs**

Combinational circuits: Half/Full Adder and Subtractor, Ripple carry adder, Carry look ahead adder, Binary Adder/Subtractor, BCD adder, Binary Multiplier, Magnitude comparator, Multiplexers, De-Multiplexers, Decoders, Encoders. Problem solving.

Unit –IV	**9 Hrs**

Sequential circuits: Flip Flop-SR, JK, T, D, Master/Slave Flip Flop, Analysis and design of clocked sequential circuits-Design-Moore/Mealy models, State minimization, State assignment, Circuit Implementation-Counters, ripple Counters, Shift Registers, Problem solving.

Unit –V	**9 Hrs**

Logic families and Programmable Logic Devices: MOS, CMOS, BiCMOS, Comparisonof logic families, implementation of combinational and logic design using standard ICs, ROM, PLA and PAL, CPLDs and Problem solving.

Text Books:

1. M. Ciletti, "Digital Morris Mano and Michael D. Design – Pearson, 5th Edition, 2013.
2. Charles H. Roth, Jr, "Fundamentals of Logic Design", Jaico Books, 4th Edition, 2002.

References:

1. William I. Fletcher, "An Engineering Approach to Digital Design", Prentice- Hall of India, 1980.
2. Floyd T.L., "Digital Fundamentals", Charles E. Merril publishing company, 1982.
3. John. F. Wakerly, "Digital Design Principles and Practices", Pearson Education, 4th Edition, 2007.
4. E-learning resources: http://nptel.ac.in/courses.php

Course Outcomes:

After the completion of the course students will able to:

CO-1: Understand various types of Code conversions.

CO-2: Apply the Boolean theorems to Simplify Complex Boolean Function through logical gates.

CO-3: Design and implement various logical devices using combinational circuits.

CO-4: Design and implement various logical devices using sequential circuits.

CO-5: Analyze sequential circuits like Registers and Counters using flip-flops.

CO-6: Demonstrate and compare the construction of programmable logic devices and different types of ROM.

UNIVERSAL HUMAN VALUES
(Common to all branches of Engineering)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
22A0021T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	HSC

Course Objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Syllabus	Total Hours:48

Unit -I	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	10 Hrs

Purpose and motivation for the course, recapitulation from Universal Human Values-I
Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.
Continuous Happiness and Prosperity- A look at basic Human Aspirations
Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment ofaspirations 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.
Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

Unit -II	Understanding Harmony in the Human Being - Harmony in Myself!	9 Hrs

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
Understanding the characteristics and activities of 'I' and harmony in 'I'
Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
Programs to ensure Sanyam and Health.
Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs. dealing with disease

Unit -III	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship	10 Hrs

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
Understanding the meaning of Trust; Difference between intention and competence
Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from

family to world family.
Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Unit -IV	**Understand the Nature and Existence hole existence as Coexis**	**9 Hrs**

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.
Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can beused), pollution, depletion of resources and role of technology etc.

Unit -V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics**	**10 Hrs**

Natural acceptance of human values
Definitiveness of Ethical Human Conduct
Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco- friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
Case studies of typical holistic technologies, management models and production systemsStrategy for transition from the present state to Universal Human Order:
a. At the level of individual: as socially and ecologically responsible engineers, technologists andmanagers
b. At the level of society: as mutually enriching institutions and organizationsSum up.
Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. Todiscuss the conduct as an engineer or scientist etc.

Textbooks:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. 3. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values andProfessional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.The Story of Stuff (Book).
3. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
4. E. FSchumacher. "Small is Beautiful"Slow is Beautiful –Cecile Andrews
5. J C Kumarappa "Economy of Permanence" Pandit Sunderlal "Bharat Mein Angreji Raj" Dharampal, "Rediscovering India"
6. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"India Wins Freedom - Maulana Abdul Kalam Azad Vivekananda - Romain Rolland(English)

Course Outcomes(CO):

On completion of this course, student will be able to:

CO-1: Students are expected to become more aware of themselves, and their surroundings (family, society, nature)

CO-2: They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO-3: They would have better critical ability.

CO-4: They would also become sensitive to their commitment towards what they have understood(human values, human relationship and human society).

CO-5: It is hoped that they would be able to apply what they have learnt to their own self in differentday-to-day settings in real life, at least a beginning would be made in this direction.

CO-6: Understand the harmony in the human being, family, society andnature/existence

ANALOG CIRCUITS

Course Code	L: T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0406T	3:0:0	3	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

- To design amplifiers using BJT & MOSFETs at low and high frequencies.
- To understand the characteristics of Multistage amplifiers
- To understand the characteristics of Differential amplifiers, feedback and power amplifiers.
- To examine the response of tuned amplifiers and multivibrators
- To categorize different oscillator circuits based on the application
- To design the electronic circuits for the given specifications and for a given application.

Syllabus		Total Hours:48
Unit –I	**Multistage and Differential Amplifiers**	**10 Hrs**

Introduction to Multistage Amplifiers, different Coupling Schemes, Cascode amplifier, Darlington pair, the MOS Differential Pair, Small-Signal Operation of the MOS Differential Pair, The BJT DifferentialPair, and other Non-ideal Characteristics of the Differential Amplifier.

Unit –II	**Frequency Response**	**10 Hrs**

Low-Frequency Response of the CS and CE Amplifiers, Internal Capacitive Effects and the High-Frequency Model of the MOSFET and the BJT, High-Frequency Response of the CS and CE Amplifiers, High-Frequency Response of the CG and Cascode Amplifiers, High-Frequency Response of the Source and Emitter Followers.

Unit –III	**Feedback Amplifiers and Oscillators**	**10 Hrs**

Feedback Amplifiers: Introduction, The General Feedback Structure, Some Properties of Negative Feedback, The Four Basic Feedback Topologies, The Feedback Voltage Amplifier (Series—Shunt), TheFeedback Trans-conductance Amplifier (Series—Series), The Feedback Trans-resistance Amplifier (Shunt—Shunt), The Feedback Current Amplifier (Shunt—Series), Summary.
Oscillators: General Considerations, Phase Shift Oscillator, Wien-Bridge Oscillator, LC Oscillators, Relaxation Oscillator, Crystal Oscillators, Illustrative Problems.

Unit –IV	**Power Amplifiers**	**9 Hrs**

Introduction, Classification of Output Stages, Class A Output Stage, Class B Output Stage, Class ABOutput Stage, Biasing the Class AB Circuit, CMOS Class AB Output Stages, Class C power amplifier and Class S power amplifier, Power BJTs, Variations on the Class AB Configuration, MOS Power Transistors, Distortions in Amplifiers

Unit –V	**Tuned Amplifiers and Multi vibrators**	**9 Hrs**

Tuned Amplifiers: Basic Principle, Use of Transformers, Single Tuned Amplifiers, and Amplifiers with multiple Tuned Circuits, Stagger Tuned Amplifiers.
Multivibrators: Analysis and Design of Bistable, Monostable, and Astable Multivibrators.

Text Books:

1. Adel. S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits," 6th Edition, Oxford University Press, 2011.
2. J. Millman, C Chalkias, "Integrated Electronics", 4thEdition, McGraw Hill Education (India) Private Ltd., 2015.
3. Millman and Taub, "Pulse, Digital and Switching Waveforms", 3rd Edition, Tata McGraw-Hill Education, 2011.

References:

1. Behzad Razavi, "Fundamentals of Micro Electronics", Wiley, 2010.
2. Donald A Neamen, "Electronic Circuits – Analysis and Design," 3rdEdition, McGraw Hill (India), 2019.
3. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits Theory", 9th Edition, Pearson/Prentice Hall, 2006.
4. K.Lal Kishore, "Electronic Circuit Analysis", 2ndEdition, B S Publications, 2008

Course Outcomes:

After the completion of the course students will able to:

CO-1: Describe the characteristics of Multistage and Differential amplifiers

CO-2: Analyze the frequency response of single stage amplifiers using BJT & FET at high and low frequencies

CO-3: Understand different feedback topologies and Oscillator circuits

CO-4: Analyze different types of large signal amplifiers

CO-5: Compare the performance of different tuned amplifiers and multivibrators

CO-6: Design of Tuned and Multivibrator for the given specifications

SIMULATION LAB					
Course Code	**L: T:P**	**Credits**	**Exam.Marks**	**Exam Duration**	**Course Type**
22A0407P	**0:0:3**	**1.5**	**CIE:30 SEE:70**	**3 Hours**	**PCC**

Course Objectives:

- To realize the concepts studied in theory
- To simulate various Signals and Systems through MATLAB
- To apply the concepts of signals to determine their energy, power, psd etc.
- To analyze the output of a system when it is excited by different types of deterministic and random signals.
- To generate random signals for the given specifications

Syllabus

LIST OF EXPERIMENTS: (**Conduct all experiments**).

Note: All the experiments are to be simulated using MATLAB or equivalent software.

1. Write a program to generate various Signals and Sequences: Periodic and Aperiodic, Unit Impulse,Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc function.
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding,Computation of Energy and Average Power.
3. Write a program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings- Plot the discrete spectrum of the signal.
4. Write a program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum.
5. Write a program to convolve two discrete time sequences. Plot all the sequences.
6. Write a program to find autocorrelation and cross correlation of given sequences.
7. Write a program to verify Linearity and Time Invariance properties of a givenContinuous/Discrete System.
8. Write a program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
9. Write a program to find magnitude and phase response of first order low pass and high pass filter.Plot the responses in logarithmic scale.
10. Write a program to find response of a low pass filter and high pass filter, when a speech signal ispassed through these filters.
11. Write a program to generate Complex Gaussian noise and find its mean, variance, ProbabilityDensity Function (PDF) and Power Spectral Density (PSD).
12. Generate a Random data (with bipolar) for a given data rate (say 10kbps).Plot the same for a timeperiod of 0.2 sec.
13. To plot pole-zero diagram in S-plane of given signal/sequence and verify its stability

References:

1. Stephen J. Chapman, "MATLAB Programming for Engineers", Cengage, November 2012.

Online Learning Resources/Virtual Labs: https://www.vlab.co.in/

Course Outcomes (CO):

After the completion of the course students will able to:

CO1: Learn how to use the MATLAB software and know syntax of MATLAB programming.

CO2: Understand how to simulate different types of signals and system response.

CO3: Find the Fourier Transform of a given signal and plot amplitude and phase characteristics.

CO4: Analyze the response of different systems when they are excited by different signals and plot power spectral density of signals.

CO5: Generate different random signals for the given specifications

CO6: Simulate different random signals for the given specifications

DIGITAL LOGIC DESIGN LAB

Course Code	L: T:P	Credits	Exam.Marks	Exam Duration	Course Type
22A0408P	**0:0:3**	**1.5**	**CIE:30 SEE:70**	**3 Hours**	**PCC**

Course Objectives:

- To construct digital circuit to examine Boolean algebra, truth table of different logic gates.
- To design various combinational and sequential circuits after analyzing their timing properties.
- To demonstrate digital circuits using Verilog and VHDL software.
- To Model the MOS, CMOS circuits using tools such as PSPICE/Multisim.

Syllabus

LIST OF EXPERIMENTS: (**Conduct any 12 experiments**)

Hardware:

1. Introduction to Digital Electronics Lab- Nomenclature of Digital Ics, Specifications, Study of the Data Sheet, Concept of Vcc and Ground, Verification of the Truth Tables of Logic Gates using TTL ICs.
2. Implementation of the Given Boolean Function using Logic Gates in Both Sop and PosForms.
3. Verification of State Tables of Rs, J-k, T and D Flip-Flops using NAND & NOR Gates
4. Implementation and Verification of Decoder and Encoder using Logic Gates.
5. Implementation of 8x1 multiplexer using Logic Gates.
6. Implementation of 4-Bit Parallel Adder Using 7483 IC.
7. Design, and Verify the 4- Bit Synchronous Counter/ Asynchronous Counter.

Software:

1. Simulation of MOS Inverter with different loads using PSPICE software
2. Simulation of CMOS Inverter for different parameters Kn, Kp as a design variable in suitable circuit simulator software.
3. Design of a 4-bit Multiplexer using VHDL\Verilog.
4. Design of a decade counter using VHDL\Verilog.
5. Design of a 3-input NAND gate and its simulation using suitable logic simulator.

Tools / Equipment Required:

- Analog - Digital & Digital-Analog ConverterFacility Available in the Laboratory:
- Power Supply (0 ---30V, +12 –0 -- -12v. +5volt).
- Multimeter (0 ---20M ohm, 0-1000 DC Volt, 0--700A.C volt, 20micro 10 Amp.)
- IC Tester (Digital and Linear)

Course Outcomes:

After the completion of the course students will able to:

CO1: Learn the basics operation of gates.

CO2: Construct basic combinational circuits and verify their functionalities**.**

CO3: Apply the design procedures to design basic sequential circuits.

CO4: Learn about counters.

CO5: Learn about Shift registers

CO6: Simulate basic digital circuits and to verify their operation in PSPICE /VHDL.

ANALOG CIRCUITS LAB

Course Code	L: T:P	Credits	Exam.Marks	Exam Duration	Course Type
22A0409P	0:0:3	1.5	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

- To understand the characteristics of Differential amplifiers, feedback and power amplifiers.
- To examine the response of tuned amplifiers and multivibrators
- To categorize different oscillator circuits based on the application
- To design the electronic circuits for the given specifications and for a given application.

Syllabus

LIST OF EXPERIMENTS: (**Conduct any 10 experiments**).

Note: All the experiments shall be implemented using both Hardware and Software.

1. Design and Analysis of Darlington pair.
2. Design and Analysis of Cascode Amplifier.
3. Frequency Response of Differential Amplifier
4. Design and Analysis of Series – Series feedback amplifier and find the frequency response of it.
5. Design and Analysis of Shunt – Shunt feedback amplifier and find the frequency response of it.
6. Design and Analysis of Class A power amplifier
7. Design and Analysis of RC phase shift oscillator
8. Design and Analysis of LC Oscillator
9. Frequency Response of Single Tuned amplifier
10. Design and Analysis of Bistable Multivibrator
11. Design and Analysis of Monostable Multivibrator
12. Design and Analysis of Astable Multivibrator

Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

References:

Online learning resources/Virtual labs: https://www.vlab.co.in/

Course Outcomes:

After the completion of the course students will able to:

CO1: Understand Characteristics and frequency response of various Multi stage amplifiers for Low, Mid and High frequencies.

CO2: Analyze Feedback amplifier for Specified gain.

CO3: Design various Oscillator Circuits.

CO4: Determine the efficiencies of Class A, B power amplifiers using BJT.

CO5: Analyze of Tuned Amplifiers.

CO6: Analyze of Multivibrators

PYTHON PROGRAMMING
(Common to CS, DS, EEE,ME and ECE)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
22A3205	1:0:2	2	CIE: 30 SEE:70	3 Hours	SC

Course Objectives:

This course will enable students to:

- Acquire programming skills in core Python
- To understand the importance of Object-oriented Programming
- Develop the skill of designing graphical-user interfaces (GUI) in Python.
- Develop the ability to write database applications in Python.

Syllabus | **Total Hours:48**

Introduction to Python: Features of Python, Data types, Operators, Input and output, Control Statements, Looping statements

Python Data Structures: Lists, Dictionaries, Tuples.

Strings: Creating strings and basic operations on strings, string testing methods.

Functions: Defining a function- Calling a function- Types of functions-Function Arguments- Anonymous functions- Global and local variables

OOPS Concepts; Classes and objects- Attributes- Inheritance- Overloading- Overriding- Data hiding

Modules and Packages: Standard modules-Importing own module as well as external modules Understanding Packages Powerful Lamda function in python Programming using functions, modules and external packages

Working with Data in Python: Printing on screen- Reading data from keyboard- Opening and closing file- Reading and writing files- Functions-Loading Data with Pandas-Numpy

Tasks:

1:OPERATORS

a. Read a list of numbers and write a program to check whether a particular element is present or not using membership operators.
b. Read your name and age and write a program to display the year in which you will turn 100 years old.
c. Read radius and height of a cone and write a program to find the volume of a cone.
d. Write a program to compute distance between two points taking input from the user (Hint: use Pythagorean theorem)

2:CONTROL STRUCTURES

a. Read your email id and write a program to display the no of vowels, consonants, digits and white spaces in it using if…elif…else statement.
b. Write a program to create and display a dictionary by storing the antonyms of words. Find the antonym of a particular word given by the user from the dictionary using while

loop.

c. Write a Program to find the sum of a Series 1/1! + 2/2! + 3/3! + 4/4! +…….+ n/n!. (Input : n = 5, Output : 2.70833)
d. In number theory, an abundant number or excessive number is a number for which the sum of its proper divisors is greater than the number itself. Write a program to find out, if the given number is abundant. (Input: 12, Sum of divisors of 12 = 1 + 2 + 3 + 4 + 6 = 16, sum of divisors 16 > original number 12)

3: LIST

a. Read a list of numbers and print the numbers divisible by x but not by y (Assume x = 4 and y = 5).
b. Read a list of numbers and print the sum of odd integers and even integers from the list.(Ex: [23, 10, 15, 14, 63], odd numbers sum = 101, even numbers sum = 24)
c. Read a list of numbers and print numbers present in odd index position. (Ex: [10, 25, 30, 47, 56, 84, 96], The numbers in odd index position: 25 47 84).
d. Read a list of numbers and remove the duplicate numbers from it. (Ex: Enter a list with duplicate elements: 10 20 40 10 50 30 20 10 80, The unique list is: [10, 20, 30, 40, 50, 80])

4: TUPLE

a. Given a list of tuples. Write a program to find tuples which have all elements divisible by K from a list of tuples. test list = [(6, 24, 12), (60, 12, 6), (12, 18, 21)], K = 6, Output : [(6, 24, 12), (60, 12, 6)]
b. Given a list of tuples. Write a program to filter all uppercase characters tuples from given list of tuples. (Input: test list = [(“GFG”, “IS”, “BEST”), (“GFg”, “AVERAGE”), (“GfG”,), (“Gfg”, “CS”)], Output : [(„GFG“, „IS“, „BEST“)]).
c. Given a tuple and a list as input, write a program to count the occurrences of all items of the list in the tuple. (Input : tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'], Output : 3)

5: SET

a. Write a program to generate and print a dictionary that contains a number (between 1 and n) in the form (x, x*x).
b. Write a program to perform union, intersection and difference using Set A and Set B.
c. Write a program to count number of vowels using sets in given string (Input : “Hello World”, Output: No. of vowels : 3)
d. Write a program to form concatenated string by taking uncommon characters from two strings using set concept (Input: S1 = "aacdb", S2 = "gafd", Output : "cbgf").

6: DICTIONARY

a. Write a program to do the following operations:
    i. Create a empty dictionary with dict() method
    ii. Add elements one at a time
    iii. Update existing key‟s value
    iv. Access an element using a key and also get() method
    v. Deleting a key value using del() method
b. Write a program to create a dictionary and apply the following methods:
    i. pop() method

ii. pop item() method
iii. clear() method

c. Given a dictionary, write a program to find the sum of all items in the dictionary.
d. Write a program to merge two dictionaries using update() method.

7: STRINGS

a. Given a string, write a program to check if the string is symmetrical and palindrome or not. A string is said to be symmetrical if both the halves of the string are the same and a string is said to be a palindrome string if one half of the string is the reverse of the other half or if a string appears same when read forward or backward.
b. Write a program to read a string and count the number of vowel letters and print all letters except 'e' and 's'.
c. Write a program to read a line of text and remove the initial word from given text. (Hint: Use split () method, Input: India is my country. Output : is my country)
d. Write a program to read a string and count how many times each letter appears. (Histogram).

8: USER DEFINED FUNCTIONS

a. A generator is a function that produces a sequence of results instead of a single value. Write a generator function for Fibonacci numbers up to n.
b. Write a function merge_dict (dict1, dict2) to merge two Python dictionaries.
c. Write a fact () function to compute the factorial of a given positive number.
d. Given a list of n elements, write a linear_search () function to search a given element x in a list.

9: BUILT-IN FUNCTIONS

a. Write a program to demonstrate the working of built-in statistical functions mean (), mode(), median() by importing statistics library.
b. Write a program to demonstrate the working of built-in trigonometric functions sin (), cos(), tan(), hypot(), degrees(), radians() by importing math module.
c. Write a program to demonstrate the working of built-in Logarithmic and Power functions exp(), log(), log2(), log10(), pow() by importing math module.
d. Write a program to demonstrate the working of built-in numeric functions ceil(), floor(), fabs(), factorial(), gcd() by importing math module.

10. CLASS AND OBJECTS

a. Write a program to create a Bank Account class. Your class should support the following methods for
   i) Deposit
   ii) Withdraw
   iii) Get Balance
   iv) Pin Change
b. Create a Savings Account class that behaves just like a Bank Account, but also has an interest rate and a method that increases the balance by the appropriate amount of interest (Hint:use Inheritance).
c. Write a program to create an employee class and store the employee name, id, age, and salary using the constructor. Display the employee details by invoking employee_info()

method and also using dictionary (_dict_).

d. Access modifiers in Python are used to modify the default scope of variables. Write a program to demonstrate the 3 types of access modifiers: public, private and protected.

11. FILE HANDLING

a. Write a program to read a filename from the user, open the file (say firstFile.txt) and then perform the following operations:
   i. Count the sentences in the file.
   ii. Count the words in the file.
   iii. Count the characters in the file.

b. Create a new file (Hello.txt) and copy the text to another file called target.txt. The target.txt file should store only lower-case alphabets and display the number of lines copied.

c. Write a Python program to store N student's records containing name, roll number and branch. Print the given branch student's details only.

Text Book:

1. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.

Reference Books:

1. Reema Thareja, "Python Programming - Using Problem Solving Approach", Oxford Press, 1st Edition, 2017.
2. Michael H Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1st Edition, 2007.
3. Yashavant Kanetkar, Aditya Kanetkar, "Let us Python", BPB publication, 1st Edition, 2019.
4. Ashok Kamthane, Amit Kamthane, "Programming and Problem Solving with Python", McGraw Hill Education (India) Private Limited, 2018.
5. Taneja Sheetal, Kumar Naveen, "Python Programming – A modular approach", Pearson, 2017

Web References:

1. https://realpython.com/python3-object-oriented-programming/
2. https://python.swaroopch.com/oop.html
3. https://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html
4. https://www.programiz.com/python-programming/
5. https://www.geeksforgeeks.org/python-programming-language/

Course Outcomes (CO):

On completion of this course, student will be able to:

CO1: Understand various data types like lists, tuples, strings etc.

CO2: Able to create practical and contemporary applications using Functions

CO3: Explore the use of Object oriented concepts to solve Real-life problems

CO4: Explore the use of Object-oriented concepts to solve Real-life problems

CO5: Utilize Python packages in developing software applications

CO6: Solve mathematical problems using Python programming language

CONSTITUTION OF INDIA

(Common to all branches of Engineering)

Course Code	L: T:P:S	Credits	Exam marks	Exam Duration	Course Type
22A0029M	**3:0:0:0**	**-**			

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court andhigh courtcontroller and auditor general of India and Election Commission of India.
- To understand the central-state relation in financial and administrative control

Syllabus		**Total Hours:48**
Unit I	**Introduction to Indian Constitution**	**10 Hrs**
Introduction to Indian Constitution – Constitution -Meaning of the term - Indian Constitution Sourcesand constitutional history - Features– Citizenship – Preamble - Fundamental Rights and Duties - Directive Principles of State Policy.		
Unit -II	**Union Government and its Administration Structure of the Indian Union**	**9 Hrs**
Union Government and its Administration Structure of the Indian Union - Federalism – Centre State relationship – President's Role, power and position - PM and Council of ministers - Cabinet and Central Secretariat –Lok Sabha - Rajya Sabha - The Supreme Court and High Court - Powers and Functions		
Unit -III	**State Government and its Administration**	**10 Hrs**
State Government and its Administration - Governor - Role and Position -CM and Council of ministers - State Secretariat-Organization Structure and Functions.		
Unit -IV	**Local Administration**	**10 Hrs**
Local Administration - District's Administration Head - Role and Importance - Municipalities - Mayor and role of Elected Representatives -CEO of Municipal Corporation Pachayati Raj - Functions– PRI –Zilla Parishath - Elected officials and their roles – CEO, Zilla Parishath - Block level Organizational Hierarchy - (Different departments) - Village level - Role of Elected and Appointed officials - Importance of grass root democracy		
Unit -V	**Election Commission**	**9 Hrs**
Election Commission - Election Commission- Role of Chief Election Commissioner and Election Commissionerate - State Election Commission -Functions of Commissions for the welfare of SC/ST/OBC and Women		

Textbooks:

1. Durga Das Basu, "Introduction to the Constitution of India", Prentice – Hall of India Pvt. Ltd.. NewDelhi
2. Subash Kashyap, "Indian Constitution", National Book Trust 3. R R Gaur, R Asthana,

Reference Books:

1. H.M.Sreevai, "Constitutional Law of India", 4th edition in 3 volumes
2. J.A. Siwach, "Dynamics of Indian Government & Politics"
3. M.V. Pylee, "Indian Constitution", Durga Das Basu, Human Rights in Constitutional Law, Prentice - Hall of India Pvt. Ltd. New Delhi
4. J.C. Johri, Indian Government and Politics Hans
5. M.V. Pylee, "Indian Constitution)

E-Resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/10910404
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture- details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Course Outcomes (CO):

On completion of this course, student will be able to:

CO1: Understand historical background of the constitution making and its importance for building a democratic India.

CO2: Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.

CO3: Understand the value of the fundamental rights for becoming good citizen of India.

CO4: Understand the value of the fundamental duties for becoming good citizen of India.

CO5: Analyze the decentralization of power between central, state and local self-government

CO6: Apply the knowledge in strengthening of the constitutional institutions like CAG,Election Commission and UPSC for sustaining democracy