GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE

(AUTONOMOUS)

NELLORE–524317 (A.P) INDIA

B.TECH - ELECTRONICS & COMMUNICATION ENGINEERING

(ACCREDITATED BY NBA)

COURSE STRUCTURE AND SYLLABIUNDER R 23 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.

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY :: NELLORE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

B. Tech – II Year I Semester

Semester - 3 (Theory-5, Lab-2, SEC-1,AC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	BS	23A0014T	Probability and Complex Variables	3	0	0	3
2.	HSMC	23A0021T	Universal Human Values– Understanding Harmony and Ethical Human Conduct	2	1	0	3
3.	ES	23A0401T	Signals, Systems and Stochastic Processes	3	0	0	3
4.	PCC	23A0402T	Electronic Devices and Circuits	3	0	0	3
5.	PCC	23A0403T	Digital Circuits Design	3	0	0	3
6.	PCC	23A0404P	Electronic Devices and Circuits Lab	0	0	3	1.5
7.	PCC	23A0405P	Digital Circuits& Signal Simulation Lab	0	0	3	1.5
8.	SEC	23A0510P	Python Programming	0	1	2	2
9.	Audit Course	23A0109T	Environmental Science	2	0	0	-
Total				**16**	**02**	**08**	**20**

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY :: NELLORE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

B. Tech. II Year II Semester

Semester - 4 ((Theory-6, Lab-2, SEC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	HSMC	23A0022T	Managerial Economics and Financial Analysis	2	0	0	2
2.	ES	23A0217T	Linear Control Systems	3	0	0	3
3.	PCC	23A0407T	EM Waves and Transmission Lines	3	0	0	3
4.	PCC	23A0408T	Electronic Circuits Analysis	3	0	0	3
5.	PCC	23A0409T	Analog and Digital Communications	3	0	0	3
6.	PCC	23A0410P	Electronic Circuits Analysis Lab	0	0	3	1.5
7.	PCC	23A0411P	Analog and Digital Communications Lab	0	0	3	1.5
8.	SEC	23A0026P	Soft Skills	0	1	2	2
9.	ES	23A0413T	Design Thinking and Innovation	1	0	2	2
Total				**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 08weeks duration during summer vacation							

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY :: NELLORE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

B. Tech – II Year I Semester

Semester - 3 (Theory-5, Lab-2, SEC-1,AC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	BS	23A0014T	Probability and Complex Variables	3	0	0	3
2.	HSMC	23A0021T	Universal Human Values– Understanding Harmony and Ethical Human Conduct	2	1	0	3
3.	ES	23A0401T	Signals, Systems and Stochastic Processes	3	0	0	3
4.	PCC	23A0402T	Electronic Devices and Circuits	3	0	0	3
5.	PCC	23A0403T	Digital Circuits Design	3	0	0	3
6.	PCC	23A0404P	Electronic Devices and Circuits Lab	0	0	3	1.5
7.	PCC	23A0405P	Digital Circuits& Signal Simulation Lab	0	0	3	1.5
8.	SEC	23A0510P	Python Programming	0	1	2	2
9.	Audit Course	23A0109T	Environmental Science	2	0	0	-
Total				**16**	**02**	**08**	**20**

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

PROBABILITY AND COMPLEX VARIABLES					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0014T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**BS**

Syllabus		**Total Hours: 45**
Unit-I	**Probability Distributions**	**9 Hrs**

Introduction to Probability Theory, Random variables (discrete and continuous), probability density functions, properties, mathematical expectation. Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh.

Moments-moments about the origin, Central moments, Variance and Skew, Chebyshev's inequality, moment generating function, characteristic function.

Unit-II	**Operations On Random Variable**	**9 Hrs**

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.

Unit -III	**Operations On Multiple Random Variables**	**9 Hrs**

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.

Unit -IV	**Complex Variable – Differentiation**	**9 Hrs**

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method.

Unit -V	**Complex Variable – Integration**	**9 Hrs**

Line integral-Contour integration, Cauchy's integral theorem(Simple Case), Cauchy Integral formula, Power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series, Residues, Cauchy Residue theorem (without proof).

Textbooks:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2002.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Edition

Reference Books:

1. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India
3. Henry Stark and John W.Woods, "Probability and Random Processes with Application to Signal Processing," 3rd Edition, Pearson Education, 2002.
4. B.V.Ramana, Higher Engineering Mathematics, Mc Graw Hill publishers.

E-resources:

1. https://onlinecourses.nptel.ac.in/noc20_ma50/preview
2. https://onlinecourses.nptel.ac.in/noc21_ma66/preview#:~:text=This%20course%20provides%20random%20variable,and%20simple%20Markovian%20queueing%20models.

Course Outcomes(CO):

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

CO1: Understand the concepts of Probability, Random Variables and their characteristics (L2)

CO2: Learn how to deal with multiple random variables, conditional probability, joint distribution and statistical independence. (L3, L5)

CO3: Formulate and solve the engineering problems involving random variables. (L3)

CO4: Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions.(L2, L3)

CO5: Understand Cauchy theorem, Cauchy integral formulas and apply these to evaluate complex contour integrals. Classify singularities and poles, residues.(L3)

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY :: NELLORE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0021T	2:1:0:0	3	CIE:30 SEE:70	3 Hours	HSMC

Course Objectives:

1. To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Syllabus

Unit-I	Introduction to Value Education (6 lectures and 3 tutorials for practice session)

- Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
- Understanding Value Education
- Practice Session PS1 Sharing about Oneself
- self-exploration as the Process for Value Education
- Continuous Happiness and Prosperity – the Basic Human Aspirations
- Exploring Human Consciousness
- Happiness and Prosperity – Current Scenario
- Method to Fulfill the Basic Human Aspirations
- Exploring Natural Acceptance

Practice Sessions for UNIT I – Introduction to Value Education

- PS1 Sharing about Oneself
- PS2 Exploring Human Consciousness
- PS3 Exploring Natural Acceptance

Unit-II	Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

- Understanding Human being as the Co-existence of the self and the body.
- Distinguishing between the Needs of the self and the body
- Exploring the difference of Needs of self and body.
- The body as an Instrument of the self
- Understanding Harmony in the self
- Exploring Sources of Imagination in the self
- Harmony of the self with the body
- Programme to ensure self-regulation and Health
- Exploring Harmony of self with the body

Practice Sessions for UNIT II – Harmony in the Human Being

- PS4 Exploring the difference of Needs of self and body
- PS5 Exploring Sources of Imagination in the self
- PS6 Exploring Harmony of self with the body

Unit -III	Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)

- Harmony in the Family – the Basic Unit of Human Interaction
- Trust' – the Foundational Value in Relationship
- Exploring the Feeling of Trust
- 'Respect' – as the Right Evaluation
- Exploring the Feeling of Respect
- Other Feelings, Justice in Human-to-Human Relationship
- Understanding Harmony in the Society
- Vision for the Universal Human Order
- Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT III – Harmony in the Family and Society

- PS7 Exploring the Feeling of Trust
- PS8 Exploring the Feeling of Respect
- PS9 Exploring Systems to fulfil Human Goal

Unit -IV	Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)

- Understanding Harmony in the Nature
- Interconnectedness, self-regulation and Mutual Fulfilment among
- the Four Orders of Nature
- Exploring the Four Orders of Nature
- Realizing Existence as Co-existence at All Levels
- The Holistic Perception of Harmony in Existence
- Exploring Co-existence in Existence.

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)

- PS10 Exploring the Four Orders of Nature
- PS11 Exploring Co-existence in Existence

Unit -V	Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)

- Natural Acceptance of Human Values
- Definitiveness of (Ethical) Human Conduct
- Exploring Ethical Human Conduct
- A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
- Competence in Professional Ethics
- Exploring Humanistic Models in Education
- Holistic Technologies, Production Systems and Management Models-Typical Case Studies
- Strategies for Transition towards Value-based Life and Profession
- Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics

- PS12 Exploring Ethical Human Conduct

- PS13 Exploring Humanistic Models in Education
- PS14 Exploring Steps of Transition towards Universal Human Order

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

Reference Books:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.

E-resources:

1. https://fdp-si.aicte-india.org/UHV- %20Class%20Notes%20&%20Handouts/UHV%20Handout%201 Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-0Respect%20July%2023.pdf

Course Outcomes(CO):

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

CO1: Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2)
CO2: Identify one's self, and one's surroundings (family, society nature) (L1, L2)
CO3: Apply what they have learnt to their own self in different day-to-day settings in real life (L3)
CO4: Relate human values with human relationship and human society. (L4)
CO5: Justify the need for universal human values and harmonious existence (L5)
CO6: Develop as socially and ecologically responsible engineers (L3, L6)

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY :: NELLORE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

SIGNALS, SYSTEMS AND STOCHASTIC PROCESSES					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0401T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**ES**

Course Objectives:

- Understanding the basics of signals and systems required for ECE courses.
- To teach concepts of signals and systems and its analysis using different transform techniques.
- To provide basic understanding of random processes which is essential for the random signals and systems encountered in communications and signal Processing areas

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Signals & Systems: Basic definitions and classification of Signals and Systems (Continuous time and discrete time), operations on signals, Concepts of Convolution and Correlation of signals, Analogy between vectors and signals-Orthogonality, mean square error,

Fourier series: Trigonometric & Exponential forms of Fourier series, Properties, Concept of discrete spectrum, Illustrative Problems.

Unit-II	**9 Hrs**

Fourier Transform: Definition, Computation and properties of Fourier transform for different types of signals and systems, Inverse Fourier transform. Sampling: Sampling theorem – Graphical and analytical proof for Band Limited Signals, Reconstruction of signal from its samples, Effect of under sampling – Aliasing. Illustrative Problems.

Laplace Transform: 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, Illustrative Problems.

Unit -III	**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 -IV	**9 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, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal, Mean and Mean-squared Value of System

Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

Unit -V	**9 Hrs**

Random Processes – Spectral Characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

Textbooks:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2002.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", 2nd Edition, PHI, 2009.

Reference Books:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002
3. Simon Haykin and Van Veen, "Signals & Systems", 2nd Edition, Wiley, 2005.
4. Matthew Sadiku and Warsame H. Ali, "Signals and Systems A primer with MATLAB", CRC Press, 2016.
5. Hwei Hsu, "Schaum's Outline of Signals and Systems", 4thEdition, TMH, 2019.

Course Outcomes(CO):

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

CO1: Understand the mathematical description and representation of continuous-time and discrete-time signals and systems.

CO2: understand the concepts of various transform techniques and Random Processes (L2)

CO3: Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems. (L3)

CO4: Formulate and solve engineering problems involving random processes. (L3)

CO5: Analyze the frequency spectra of various continuous-time signals using different transform methods. (L4)

CO6: Classify the systems based on their properties and determine the response of them. (L4)

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY :: NELLORE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

ELECTRONIC DEVICES & CIRCUITS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0402T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PCC**

Course Objectives:

- Students will be able understand the basic principles of all semiconductor devices.
- Able to analyze diode circuits, various biasing and small signal equivalent circuits of amplifiers, compare the performance of BJTs and MOSFETs
- Able to design rectifier circuits and various amplifier circuits using BJTs and MOSFETs.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

PN junction diode: Band structure of PN Junction, Quantitative Theory of PN Diode, types of PN junction diode, VI Characteristics, PN diode current equation, Diode resistance, Transition and Diffusion Capacitance, effect of temperature on PN junction diode, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics, Clipping and Clamping circuits, Voltage doubler ,Illustrative problems.

Special Diodes: Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, Varactor Diode, LED, LCD, Photo Diode, SCR and UJT.

Unit-II	**9 Hrs**

Bipolar Junction Transistors: Transistor construction, BJT Operation, Transistor as an Amplifier and as a Switch, Common Emitter, Common Base and Common Collector Configurations, Limits of Operation, BJT Specifications.

Biasing and Stabilization: Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Collector to Base Bias, Self-Bias, Bias Stability, Thermal Runaway, Thermal Stability, Illustrative problems

Unit -III	**9 Hrs**

MOS Field Effect Transistors: Introduction, Device Structure and Physical Operation, CMOS, V - I Characteristics, MOSFET Circuits at DC, MOSFET as an Amplifier and as a Switch. Biasing in MOS **Amplifier circuits** - biasing by fixing VGS with and without source resistance, biasing using drain to gate feedback resistor, biasing using constant current source, body effect, Problem solving.

Unit -IV	**9 Hrs**

BJT Small Signal Operation and Models- the transconductance, input resistance at the base, input resistance at the emitter, Voltage gain, separating the Signal and the DC Quantities, The Hybrid π Model, the T Model. Single Stage BJT Amplifiers - Common-Emitter (CE) amplifier without and with emitter resistance, Common-Base (CB) amplifier, Common-Collector (CC) amplifier or Emitter Follower, Problem solving.

Unit -V	**9 Hrs**

MOSFET Small Signal Operation Models– the dc bias, separating the DC analysis and the signal analysis, Small signal equivalent circuit models, the transconductance, the T equivalent circuit model, Single stage MOS Amplifiers – common source (CS) amplifier without and with source resistance, common gate (CG) amplifier, source follower, Problem Solving.

Textbooks:

1. Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits – Theory and Applications", 6th Edition, Oxford Press, 2013.
2. J. Milliman and C Halkias, "Integrated electronics", 2nd Edition, Tata McGraw Hill, 1991.

Reference Books:

1. Donald A Neamen, "Electronic Circuits – analysis and design", 3rd Edition, McGraw Hill (India), 2019.
2. Behzad Razavi, "Microelectronics", Second edition, Wiley, 2013.
3. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits," 9th Edition, Pearson, 2006.
4. Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series, 3rd edition, McGraw-Hill (India), 2010.

Course Outcomes(CO):

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

CO1: Understand principle of operation, characteristics and applications of Semiconductor diodes, Bipolar Junction Transistor and MOSFETs. (L2)

CO2: Applying the basic principles solving the problems related to Semiconductor diodes, BJTs, and MOSFETs. (L3)

CO3: Analyze diode circuits for different applications such as rectifiers, clippers and clampers (L4)

CO4: analyze biasing circuits of BJTs, and MOSFETs. (L4)

CO5: Design of diode circuits and amplifiers using BJTs, and MOSFETs. (L4)

CO6: Compare the performance of various semiconductor devices. (L4)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

DIGITAL CIRCUITS DESIGN					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0403T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PCC**

Course Objectives:

- Understand the properties of Boolean algebra, logic operations, and minimization of Boolean functions.
- Analyze combinational and analyze sequential logic circuits.
- Understand the concepts of FSM and compare various Programmable logic devices.
- Model combinational and sequential circuits using HDLs.

Syllabus		**Total Hours: 45**
Unit-I	**Boolean algebra, logic operations, and minimization of Boolean functions**	**9 Hrs**

Number Systems and Codes, Representation of unsigned and signed integers, Floating Point representation of real numbers, Laws of Boolean Algebra, Theorems of Boolean Algebra, Realization of functions using logic gates, Canonical forms of Boolean Functions, Minimization of Functions using Karnaugh Maps.

Unit-II	**Combinational Logic Circuits**	**9 Hrs**

Combinational circuits, Design with basic logic gates, design procedure, adders, subtractors, 4-bit binary adder/ subtractor circuit, BCD adder, carry look- a-head adder, binary multiplier, magnitude comparator, data selectors, priority encoders, decoders, multiplexers, demultiplexers.

Unit -III	**Hardware Description Language**	**9 Hrs**

Introduction to Verilog - structural specification of logic circuits, behavioral specification of logic circuits, hierarchical Verilog Code, Verilog for combinational circuits - conditional operator, if-else statement, case statement, for loop using storage elements with CAD tools-using Verilog constructs for storage elements, flip-flop with clear capability, using Verilog constructs for registers and counters.

Unit -IV	**Sequential Logic Circuits**	**9 Hrs**

Basic architectural distinction between combinational and sequential circuits, Design procedure, latches, flip-flops, truth tables and excitation tables, timing and triggering consideration, conversion of flip- flops, design of counters, ripple counters, synchronous counters, ring counter, Johnson counter, registers, shift registers, universal shift register.

Unit -V	**Finite State Machines and Programmable Logic Devices**	**9 Hrs**

Types of FSM, capabilities and limitations of FSM, state assignment, realization of FSM using flip-flops, Mealy to Moore conversion and vice-versa, reduction of state tables using partition technique, Design of sequence detector. Types of PLD's: PROM, PAL, PLA, basic structure of CPLD and FPGA, advantages of FPGAs, Design of sequential circuits using ROMs, PLAs, CPLDs and FPGAs,

Textbooks:

1. M. Morris Mano, "Digital Design", 3rd Edition, PHI. (Unit I to IV)
2. Stephen Brown and ZvonkoVranesic, "Fundamentals of Digital Logic with Verilog Design", 3rd Edition, McGraw-Hill (Unit V)

Reference Books:

1. Charles H. Roth, Jr, "Fundamentals of Logic Design", 4th Edition, Jaico Publishers.
2. ZviKohavi and NirajK.Jha, "Switching and Finite Automata Theory, 3rd Edition, Cambridge University Press, 2010.
3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2nd Edition, Prentice Hall PTR.
4. D.P. Leach, A.P. Malvino, "Digital Principles and Applications", TMH, 7th Edition.

Course Outcomes(CO):

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

CO1: Understand the properties of Boolean algebra and logic operations (L2)

CO2: Understand the concepts of FSM (L2)

CO3: Apply techniques for minimization of Boolean functions (L3)

CO4: Analyze combinational and Sequential logic circuits. (L4)

CO5: Compare various Programmable logic devices. (L4)

CO6: Design and Model combinational and sequential circuits using HDLs. (L5, L6)

ELECTRONIC DEVICES & CIRCUITS LAB

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY :: NELLORE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
23A0404P	**0:0:3**	**1.5**	**CIE:30** **SEE:70**	**3 Hours**	**PCC**

Syllabus

LIST OF EXPERIMENTS: (**Execute any 12 experiments**).

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

1. Verification of Volt- Ampere characteristics of a PN junction diode and find static, dynamic and reverse resistances of the diode from the graphs obtained.
2. Design a full wave rectifier for the given specifications with and without filters, and verify the given specifications experimentally. Vary the load and find ripple factor. Draw suitable graphs.
3. Verify various clipping and clamper circuits using PN junction diode and draw the suitable graphs.
4. Design a Zener diode-based ***voltage regulator*** against variations of supply and load. Verify the same from the experiment.
5. Study and draw the ***output*** and ***transfer*** characteristics of MOSFET (Enhance mode) in Common Source Configuration experimentally. Find ***Threshold voltage (V_T), g_m, & K*** from the graphs.
6. Study and draw the ***output*** and ***transfer*** characteristics of MOSFET (Depletion mode) or JFET in Common Source Configuration experimentally. Find ***I_{DSS}, g_m, & V_P*** from the graphs.
7. Verification of the input and output characteristics of BJT in **Common Emitter** configuration experimentally and find required ***h – parameters*** from the graphs.
8. Study and draw the input and output characteristics of BJT in **Common Base** configuration experimentally and determine required ***h – parameters*** from the graphs.
9. Study and draw the Volt Ampere characteristics of UJT and determine ***η, I_P, I_v, V_P, &Vv*** from the experiment.
10. Design and analysis of voltage- divider bias/self-bias circuit using BJT.
11. Design and analysis of self-bias circuit using MOSFET.
12. Design a suitable circuit for switch using MOSFET/BJT.
13. Design a small signal amplifier using MOSFET (common source) for the given specifications. Draw the frequency response and find the bandwidth.
14. Design a small signal amplifier using BJT(common emitter) for the given specifications. Draw the frequency response and find the bandwidth.

Tools / Equipment Required: Software Toollike Multisim/ Pspice or Equivalent,

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

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Course Outcomes:

After the completion of the course students will be able to:

CO1: Understand the characteristics and applications of basic electronic devices. (L2)

CO2: Plot the characteristics of electronic devices. (L3)

CO3: Analyze various biasing circuits and electronic circuits as amplifiers (L4).

CO4: Design MOSFET / BJT based amplifiers for the given specifications. (L5)

CO5: Simulate all circuits in PSPICE /Multisim. (L5).

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

DIGITAL DESIGN & SIGNAL SIMULATION LAB					
Course Code	**L:T:P**	**Credits**	**Exam. Marks**	**Exam Duration**	**Course Type**
23A0405P	**0:0:3**	**1.5**	**CIE:30** **SEE:70**	**3 Hours**	**PCC**

Syllabus

PART A

1. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.
2. Verification of functional table of 3 to 8-line Decoder /De-multiplexer
3. 4 variable logic function verification using 8 to1 multiplexer.
4. Design full adder circuit and verify its functional table.
5. Design a four-bit ring counter using D Flip–Flops/JK Flip Flop and verify output.
6. Design a four-bit Johnson's counter using D Flip-Flops/JK Flip Flops and verify output.

Note: Design the above Experiments by using both Hardware kits and Hardware Description Language

7. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
8. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip-Flops and Test It with a low frequency clock and sketch the output waveforms.
9. Design MOD–8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms.
10. (a) Draw the circuit diagram of a single bit comparator and test the output
    (b) Construct 7 Segment Display Circuit Using Decoder and7 Segment LED and test it.

Note: Design and verify above Experiments by using Hardware Description Language

References:

1. M. Morris Mano, "Digital Design", 3rd Edition, PHI

PART B

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 given Continuous 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 generate Complex Gaussian noise and find its mean, variance, Probability Density Function (PDF) and Power Spectral Density (PSD).
11. Generate a Random data (with bipolar) for a given data rate (say 10kbps). Plot the same for a time period of 0.2 sec.
12. To plot pole-zero diagram in S-plane of given signal/sequence and verify its stability.

Note: Any 10 experiments. All the experiments are to be simulated using MATLAB or equivalent software.

References:

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

Course Outcomes:

After the completion of the course students will be able to:

CO1: Verify the truth tables of various logic circuits. (L2)

CO2: Understand how to simulate different types of signals and system response. (L2)

CO3: Design sequential and combinational logic circuits and verify their functionality. (L3, L4)

CO4: Analyze the response of different systems when they are excited by different signals and plot power spectral density of signals. (L4)

CO5: Generate different random signals for the given specifications. (L5)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

PYTHON PROGRAMMING					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0510P	**0:1:2:0**	**2**	**CIE:30** **SEE:70**	**3 Hours**	**SEC**

Course Objectives:

The main objectives of the course are to

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook. Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language. Control Flow Statements: if statement, if-else statement, if…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.

   i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

Unit-II	**9 Hrs**

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

7. Write a program to define a function with multiple return values.

8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list: additionii. insertioniii. slicing
12. Write a program to perform any 5 built-in functions by taking any list

Unit -III	**9 Hrs**

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:

13. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
14. Write a program to count the number of vowels in a string (No control flow allowed).
15. Write a program to check if a given key exists in a dictionary or not.
16. Write a program to add a new key-value pair to an existing dictionary.
17. Write a program to sum all the items in a given dictionary.

Unit -IV		**9 Hrs**

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

18. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

Unit -V	**9 Hrs**

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

24. Python program to check whether a JSON string contains complex object or not.

25. Python Program to demonstrate NumPy arrays creation using array () function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
    a) Apply head () function to the pandas data frame
    b) Perform various data selection operations on Data Frame
30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

Textbooks:

1. Stuart Russell and Peter Norvig, Artificial Intelligence A Modern Approach, 3rdEdition, Pearson Education.
2. Elaine Rich, Kevin Knight & Shivashankar B Nair, "Artificial Intelligence", 3rd - Edition, McGraw Hill Education.

Reference Books:

1. Gowri shankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

E-resources:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

Course Outcomes(CO):

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

CO1: Showcase adept command of Python syntax, deftly utilizing variables, data types, control structures, functions, modules, and exception handling to engineer robust and efficient code solutions. (L4)
CO2: Apply Python programming concepts to solve a variety of computational problems (L3)
CO3: Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs (L3)
CO4: Proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas (L2)
CO5: Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries (L3)

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B. Tech ECE – RG 23 Regulation

ENVIRONMENTAL SCIENCE					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0109T	**2:0:0:0**	**-**	**CIE: 30**	**-**	**Audit Course**

Course Objectives:

- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers

Syllabus

Unit-I

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

Unit-II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem.

Biodiversity and its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit -III

Environmental Pollution: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution

c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Unit -IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

Unit -V

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

Textbooks:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, “Environmental Studies”, Pearson education
3. S.Azeem Unnisa, “Environmental Studies” Academic Publishing Company
4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, Scitech Publications (India), Pvt. Ltd.

Reference Books:

1. Deeksha Dave and E.Sai Baba Reddy, “Textbook of Environmental Science”, Cengage Publications.
2. M.Anji Reddy, “Text book of Environmental Sciences and Technology”, BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, “Environmental Sciences and Engineering”, Prentice hall of India Private limited

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

B. Tech. II Year II Semester

Semester - 4 ((Theory-6, Lab-2, SEC-1)							
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	HSMC	23A0022T	Managerial Economics and Financial Analysis	2	0	0	2
2.	ES	23A0217T	Linear Control Systems	3	0	0	3
3.	PCC	23A0407T	EM Waves and Transmission Lines	3	0	0	3
4.	PCC	23A0408T	Electronic Circuits Analysis	3	0	0	3
5.	PCC	23A0409T	Analog and Digital Communications	3	0	0	3
6.	PCC	23A0410P	Electronic Circuits Analysis Lab	0	0	3	1.5
7.	PCC	23A0411P	Analog and Digital Communications Lab	0	0	3	1.5
8.	SEC	23A0026P	Soft Skills	0	1	2	2
9.	ES	23A0413T	Design Thinking and Innovation	1	0	2	2
Total				**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 08weeks duration during summer vacation							

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B. Tech ECE – RG 23 Regulation

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0022T	**2:0:0:0**	**2**	**CIE:30** **SEE:70**	**3 Hours**	**HSMC**

Course Objectives:

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

Syllabus		**Total Hours: 45**
Unit-I	**Managerial Economics**	**9 Hrs**

Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

Unit-II	**Production and Cost Analysis**	**9 Hrs**

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

Unit -III	**Business Organizations and Markets**	**9 Hrs**

Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies

Unit -IV	**Capital Budgeting**	**9 Hrs**

Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

Unit -V	**Financial Accounting and Analysis**	**9 Hrs**

Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance-Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and

Capital structure Ratios and Profitability.

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

E-resources:

1. https://www.slideshare.net/123ps/managerial-economics-ppt
2. https://www.slideshare.net/rossanz/production-and-cost-45827016
3. https://www.slideshare.net/darkyla/business-organizations-19917607
4. https://www.slideshare.net/balarajbl/market-and-classification-of-market
5. https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
6. https://www.slideshare.net/ashu1983/financial-accounting

Course Outcomes(CO):

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

CO1: Define the concepts related to Managerial Economics, financial accounting and management(L2)
CO2: Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2)
CO3: Apply the Concept of Production cost and revenues for effective Business decision (L3)
CO4: Analyze how to invest their capital and maximize returns (L4)
CO5: Evaluate the capital budgeting techniques. (L5)
CO6: Develop the accounting statements and evaluate the financial performance of business entity (L5)

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B. Tech ECE – RG 23 Regulation

LINEAR CONTROL SYSTEMS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0217T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**ES**

Course Objectives:

- Introduce the basic principles and applications of control systems.
- Learn the time response and steady state response of the systems.
- Know the time domain analysis and solutions to time invariant systems.
- Understand different aspects of stability analysis of systems in frequency domain.
- Understand the concept of state space, controllability and observability.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Control Systems Concepts: Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula. Controller components, DC Servomotor and AC Servomotor- their transfer functions, Synchros.

Unit-II	**9 Hrs**

Time Response Analysis: Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants, Study of effects and Design of P, PI, PD and PID Controllers on second order system.

Unit -III	**9 Hrs**

Stability Analysis in Time Domain: The concept of stability – Routh's stability criterion – Stability and conditional stability - limitations of Routh's stability. The Root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

Unit -IV	**9 Hrs**

Frequency Response Analysis: Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram - Stability Analysis from Bode Plots. Polar Plots- Nyquist Plots- Phase margin and Gain margin-Stability Analysis.

Compensation techniques – Study of Effects and Design of Lag, Lead, Lag-Lead Compensator design in frequency Domain on a second order system.

Unit -V	**9 Hrs**

State Space Analysis of Continuous Systems: Concepts of state, state variables and state model - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models. The concepts of controllability and observability, Duality between controllability and observability.

Textbooks:

1. Modern Control Engineering by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. Control Systems Engineering by I. J. Nagrath and M. Gopal, New Age International (P) Limited Publishers, 5th edition, 2007.

Reference Books:

1. Control Systems Principles & Design by M.Gopal, 4th Edition, McGraw Hill Education,2012.
2. Automatic Control Systems by B. C. Kuo and Farid Golnaraghi, John wiley and sons, 8th edition,2003.
3. Feedback and Control Systems, Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, 2nd Edition, Schaum's outlines, McGraw Hill Education,2013.
4. Control System Design by Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, Pearson, 2000.
5. Feedback Control of Dynamic Systems by Gene F. Franklin, J.D. Powell and Abbas Emami- Naeini, 6th Edition, Pearson,2010.

Course Outcomes(CO):

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

CO1: Summarize the basic principles and applications of control systems. (L2)
CO2: Understand the time response and steady state response of the systems. (L2)
CO3: Understand the concept of state space, controllability and observability. (L2)
CO4: Apply time domain analysis to find solutions to time invariant systems. (L3)
CO5: Analyze different aspects of stability analysis of systems in frequency domain. (L4)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

EM WAVES AND TRANSMISSION LINES					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0407T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PCC**

Course Objectives:

- To understand and analyze different laws and theorems of electrostatic fields.
- To study and analyze different laws and theorems of magnetostatic fields.
- Analyzing Maxwell's equations in different forms.
- To learn the concepts of wave theory and its propagation through various mediums.
- To get exposure to the properties of transmission lines.

Syllabus	**Total Hours: 45**
Unit-I	**9 Hrs**

Review of Co-ordinate Systems, **Electrostatics:** Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems.

Unit-II	**9 Hrs**

Magnetostatics: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems**.**

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface, Illustrative Problems.

Unit -III	**9 Hrs**

EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types, Illustrative Problems.

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem, Illustrative Problems.

Unit -IV	**9 Hrs**

Transmission Lines - I : Types, Parameters, T & π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.

Unit -V	**9 Hrs**

Transmission Lines – II: Input Impedance Relations, Reflection Coefficient, VSWR, Average Power, Shorted Lines, Open Circuited Lines, and Matched Lines, Low loss radio frequency and UHF Transmission lines, UHF Lines as Circuit Elements, Smith Chart – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.

Textbooks:

1. Elements of Electromagnetics, Matthew N.O. Sadiku, 4th Edition, Oxford University Press, 2008.
2. Electromagnetic Waves and Radiating Systems, E.C. Jordan and K.G. Balmain, 2nd Edition, PHI, 2000.

Reference Books:

1. Electromagnetic Field Theory and Transmission Lines, G. S. N. Raju, 2nd Edition, Pearson Education, 2013.
2. Engineering Electromagnetics, William H. Hayt Jr. and John A. Buck, 7th Edition, Tata McGraw Hill, 2006.
3. Electromagnetics, John D. Krauss, 3rd Edition, McGraw Hill, 1988.
4. Networks, Lines, and Fields, John D. Ryder,2nd Edition, PHI publications, 2012.

Course Outcomes(CO):

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

CO1: Learn the concepts of wave theory and its propagation through various mediums. (L2)
CO2: Understand the properties of transmission lines and their applications. (L2)
CO3: Apply the laws & theorems of electrostatic fields to solve the related problems (L3)
CO4: Gain proficiency in the analysis and application of magnetostatic laws and theorems (L4).
CO5: Analyze Maxwell's equations in different forms. (L4)

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY :: NELLORE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

ELECTRONIC CIRCUITS ANALYSIS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0408T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PCC**

Course Objectives:

- Understand the characteristics of Differential amplifiers, feedback and power amplifiers.
- Analyze the response of tuned amplifiers
- Categorize different oscillator circuits based on the application
- Design the electronic circuits for the given specifications and for a given application.

Syllabus		**Total Hours: 45**
Unit-I	**Multistage and Differential Amplifiers**	**9 Hrs**

Introduction –Classification of Amplifiers- Distortion in amplifiers, Coupling Schemes, RC Coupled Amplifier using BJT, Cascaded RC Coupled BJT Amplifiers, Cascode amplifier, Darlington pair, the MOS Differential Pair, Small-Signal Operation of the MOS Differential Pair, The BJT Differential Pair, and other Non-ideal Characteristics of the Differential Amplifier.

Unit-II	**Frequency Response**	**9 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, follower, CE, CG and Cascode Amplifiers

Unit -III	**Feedback Amplifiers**	**9 Hrs**

Feedback Amplifiers: Introduction, The General Feedback Structure, Some Properties of Negative Feedback, The Four Basic Feedback Topologies, The Feedback Voltage Amplifier (Series—Shunt), The Feedback Transconductance Amplifier (Series—Series), The Feedback Trans-Resistance Amplifier (Shunt—Shunt), The Feedback Current Amplifier (Shunt—Series).

Unit -IV	**Oscillators and Tuned Amplifiers**	**9 Hrs**

Oscillators: General Considerations, Phase Shift Oscillator, Wien-Bridge Oscillator, LC Oscillators, Relaxation Oscillator, Crystal Oscillators, Illustrative Problems.

Tuned Amplifiers: Basic Principle, Use of Transformers, Single Tuned Amplifiers, Amplifiers with multiple Tuned Circuits, Stagger Tuned Amplifiers.

Unit -V	**Power Amplifiers**	**9 Hrs**

Introduction, Classification of Output Stages, Class A Output Stage, Class B Output Stage, Class AB Output Stage, Biasing the Class AB Circuit, CMOS Class AB Output Stages, Power BJTs, Variations on the Class AB Configuration, MOS Power Transistors.

Textbooks:

1. Millman, C Chalkias, "Integrated Electronics", 4thEdition, McGraw Hill Education (India) Private Ltd., 2015.
2. Adel. S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits," 6th Edition, Oxford University Press, 2011.

Reference Books:

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.

Course Outcomes(CO):

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

CO1: Understand the characteristics of differential amplifiers, feedback and power amplifiers. (L2)

CO2: Examine the frequency response of multistage and differential amplifier circuits using BJT & MOSFETs at low and high frequencies. (L3)

CO3: Investigate different feedback and power amplifier circuits based on the application. (L4)

CO4: Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillator circuits. (L4)

CO5: Evaluate the performance of different tuned amplifiers (L5)

CO6: Design analog circuits for the given specifications and application. (L6)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

ANALOG AND DIGITAL COMMUNICATIONS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0409T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**PCC**

Course Objectives:

- Introduce various modulation and demodulation techniques of analog and digital communication systems.
- Analyze different parameters of analog and digital communication techniques.
- Understand function of various stages of AM, FM transmitters and Know characteristics of AM &FM receivers.
- Analyze the performance of various digital modulation techniques in the presence of AWGN.

Syllabus		**Total Hours: 45**
Unit-I	**Continuous Wave Modulation**	**9 Hrs**

Introduction: The communication Process, Communication Channels, Baseband and Pass band Signals, Analog vs. Digital Communications, Need for the modulation.

Amplitude Modulation (AM): AM and its modifications – DSB, SSB, VSB. Frequency Translation, Frequency Division Multiplexing (FDM).

Angle Modulation: Frequency Modulation (FM), Phase Modulation, PLL, Nonlinear Effects in FM, Super heterodyne Receivers.

Unit-II	**Noise and Pulse Modulation**	**9 Hrs**

Introduction to Noise: Types of Noise, Receiver Model, Noise in AM, DSB, SSB, and FM Receivers, Pre-Emphasis and De-emphasis in FM.

Introduction to Pulse Modulation: The Sampling Process, PAM, TDM, Bandwidth-Noise Trade off, Quantization process, PCM, Noise considerations in PCM systems, Delta Modulation, DPCM, Coding speech at low bit rates.

Unit -III	**Baseband Pulse Transmission**	**9 Hrs**

Introduction, Matched Filter, Properties of Matched Filter, Error rate due to noise, Inter Symbol Interference (ISI), Nyquist Criterion for distortion less baseband binary transmission, Correlative level coding, Baseband M-ary PAM transmission, QAM, MAP and ML decoding, Equalization, Eye pattern.

Unit -IV	**Digital Pass band Transmission**	**9 Hrs**

Introduction, Pass band Transmission Model, Gram-Schmidt Orthogonalization Procedure, Geometric Interpretation of Signals, Response of bank of correlators in noise, Correlation receiver, Probability of Error, Detection of Signals with unknown phase.

Unit -V	**Digital Modulation Schemes**	**9 Hrs**

Coherent Digital Modulation Schemes – ASK, BPSK, BFSK, QPSK, Non-coherent BFSK, and DPSK. M-ary Modulation Techniques, Power Spectra, Bandwidth Efficiency, Timing and Frequency synchronization. Information theory: Entropy, Mutual Information and Channel capacity theorem.

Textbooks:

1. Simon Haykin, "Communication Systems", JohnWiley& Sons, 4th Edition, 2004.
2. B. P. Lathi, Zhi Ding " Modern Digital and Analog Communication Systems", Oxford press, 2011.

Reference Books:

1. Sam Shanmugam, "Digital and Analog Communication Systems",JohnWiley& Sons, 1999.
2. Bernard Sklar, F. J. harris"Digial Communications: Fundamentals andApplications", Pearson Publications, 2020.
3. Taub and Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2007.

Course Outcomes(CO):

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

CO1: Recognize the basic terminology used in analog and digital communication technique for transmission of information/data. (L1)

CO2: Explain the basic operation of different analog communication systems at baseband and pass band level. (L2)

CO3 Explain the basic operation of different digital communication systems at baseband and pass band level. (L2)

CO4: Compute various parameters of baseband and pass band transmission schemes by applying basic engineering knowledge. (L3)

CO5: Analyze the performance of different modulation & demodulation techniques to solve complex problems in the presence of noise. (L4)

CO6: Evaluate the performance of all analog and digital modulation techniques to know the merits and demerits of each one of them in terms of bandwidth and power efficiency. (L5)

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B. Tech ECE – RG 23 Regulation

ELECTRONIC CIRCUITS ANALYSIS LAB					
Course Code	**L:T:P**	**Credits**	**Exam. Marks**	**Exam Duration**	**Course Type**
23A0410P	**0:0:3**	**1.5**	**CIE:30** **SEE:70**	**3 Hours**	**PCC**

Syllabus

List of Experiments:

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

Note: At least 10 experiments shall be performed. Both BJT and MOSFET based circuits shall be implemented.

Faculty members who are handling the laboratory shall see that students are given design specifications for a given circuit appropriately and monitor the design and analysis aspects of the circuit.

Course Outcomes:

After the completion of the course students will be able to:

CO1: Know about the usage of equipment/components/software tools used to conduct experiments in analog circuits. (L2)

CO2: Conduct the experiment based on the knowledge acquired in the theory about various analog circuits using BJT/MOSFETs to find the important parameters of the circuit experimentally. (L3)

CO3: Analyze the given analog circuit to find required important metrics of it theoretically. (L4)

CO4: Compare the experimental results with that of theoretical ones and infer the conclusions. (L4)

CO5: Design the circuit for the given specifications. (L6)

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B. Tech ECE – RG 23 Regulation

ANALOG AND DIGITAL COMMUNICATIONS LAB					
Course Code	**L:T:P**	**Credits**	**Exam. Marks**	**Exam Duration**	**Course Type**
23A0411P	**0:0:3**	**1.5**	**CIE:30** **SEE:70**	**3 Hours**	**PCC**

Syllabus

List of Experiments:

Design the circuits and verify the following experiments taking minimum of six from each section shown below.

Section-A

1. AM Modulation and Demodulation
2. DSB-SC Modulation and Demodulation
3. Frequency Division Multiplexing
4. FM Modulation and Demodulation
5. Radio receiver measurements
6. PAM Modulation and Demodulation
7. PWM Modulation and Demodulation
8. PPM Modulation and Demodulation

Section-B

1. Sampling Theorem.
2. Time Division Multiplexing
3. Delta Modulation and Demodulation
4. PCM Modulation and Demodulation
5. BPSK Modulation and Demodulation
6. BFSK Modulation and Demodulation
7. QPSK Modulation and Demodulation
8. DPSK Modulation and Demodulation

Note: Faculty members (who are handling the laboratory) are requested to instruct the students not to use readymade kits for conducting the experiments. They are advised to make the students work in the laboratory by constructing the circuits and analyzing them during the lab sessions.

Course Outcomes:

After the completion of the course students will be able to:

CO1: Know about the usage of equipment/components/software tools used to conduct experiments in analog and digital modulation techniques. (L2)

CO2: Conduct the experiment based on the knowledge acquired in the theory about modulation and demodulation schemes to find the important metrics of the communication system experimentally. (L3)

CO3: Analyze the performance of a given modulation scheme to find the important metrics of the system theoretically. (L4)

CO4: Compare the experimental results with that of theoretical ones and infer the conclusions. (L4)

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B. Tech ECE – RG 23 Regulation

SOFT SKILLS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0026P	**0:1:2:0**	**2**	**CIE:30** **SEE:70**	**3 Hours**	**SESC**

Course Objectives:

- To encourage all round development of the students by focusing on soft skills
- To make the students aware of critical thinking and problem-solving skills
- To enhance healthy relationship and understanding within and outside an organization
- To function effectively with heterogeneous teams

Syllabus

Unit-I	**Soft Skills & Communication Skills**

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills - Significance, process, types - Barriers of communication - Improving techniques.

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self- expression – articulating with felicity.

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation.

Unit-II	**Problem Solving & Decision Making**

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the Problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.

Case Study & Group Discussion

Unit -III	**Critical Thinking**

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open mindedness– Creative Thinking - Positive thinking - Reflection

Activities:

Gathering information and statistics on a topic - sequencing – assorting – reasoning –

critiquing issues –placing the problem – finding the root cause - seeking viable solution –

judging with rationale – evaluating the views of others - Case Study, Story Analysis

Case Study & Group Discussion

Unit -IV	**Emotional Intelligence & Stress Management**

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.

Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

Unit -V	**Corporate Etiquette**

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette -Corporate grooming tips -Overcoming challenges

Activities

Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

Textbooks:

1. Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, Personality Development and Soft Skills: Preparing for Tomorrow, I K International Publishing House, 2018

Reference Books:

1. Sharma, Prashant, Soft Skills: Personality Development for Life Success, BPB Publications 2018.
2. Alex K, Soft Skills S.Chand & Co, 2012 (Revised edition)
3. Gajendra Singh Chauhan & Sangeetha Sharma, Soft Skills: An Integrated Approach to Maximise Personality Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, Soft Skills and Employability Skills, Cambridge University Press, 2018
5. Soft Skills for a Big Impact (English, Paperback, Renu Shorey) Publisher: Notion Press
6. Dr. Rajiv Kumar Jain, Dr. Usha Jain, Life Skills (Paperback English) Publisher : Vayu Education of India, 2014

Online Learning Resources:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc
7. https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/
8. https://onlinecourses.nptel.ac.in/noc24_hs15/preview

Course Outcomes(CO):

On completion of this course, student will be able to:
CO1: List out various elements of soft skills (L1, L2)
CO2: Describe methods for building professional image (L1, L2)
CO3: Apply critical thinking skills in problem solving (L3)
CO4: Analyse the needs of an individual and team for well-being (L4)
CO5: Assess the situation and take necessary decisions (L5)
CO6: Create a productive workplace atmosphere using social and work-life skills ensuring personal and emotional well-being (L6)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

DESIGN THINKING & INNOVATION					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
23A0413T	**1:0:2:0**	**2**	**CIE:30** **SEE:70**	**3 Hours**	**ES**

Course Objectives:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Syllabus

Unit-I	**Introduction to Design Thinking**

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

Unit-II	**Design Thinking Process**

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

Unit -III	**Innovation**

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

Unit -IV	**Product Design**

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

Unit -V	**Design Thinking in Business Processes**

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

Activity: How to market our own product, About maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown,Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell,Universal Principles of Design- Kritinaholden, Jill Butter.
4. Chesbrough.H, The Era of Open Innovation – 2013

Online Learning Resources:

https://nptel.ac.in/courses/110/106/110106124/
https://nptel.ac.in/courses/109/104/109104109/
https://swayam.gov.in/nd1_noc19_mg60/preview

Course Outcomes(CO):

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

CO1: Define the concepts related to design thinking. (L1, L2)
CO2: Explain the fundamentals of Design Thinking and innovation (L1, L2)
CO3: Apply the design thinking techniques for solving problems in various sectors. (L3)
CO4: Analyse to work in a multidisciplinary environment (L4)
CO5: Evaluate the value of creativity (L5)
CO6: Formulate specific problem statements of real time issues (L3, L6)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

COMMUNITY SERVICE PROJECT
(Experiential learning through community engagement)

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- Management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, housewives, etc
- A logbook must be maintained by each of the students, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty in charge.
- An evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.

- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project reports should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training.

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
  - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
  - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
    - Agriculture
    - Health
    - Marketing and Cooperation
    - Animal Husbandry
    - Horticulture
    - Fisheries
    - Sericulture
    - Revenue and Survey
    - Natural Disaster Management
    - Irrigation
    - Law & Order
    - Excise and Prohibition
    - Mines and Geology
    - Energy
    - Internet
    - Free Electricity
    - Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills.

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity.

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research.

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment.
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals.
- New energy, enthusiasm and perspectives applied to community work.
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY :: NELLORE

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech ECE – RG 23 Regulation

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expected to carry out these projects with involvement, commitment, responsibility, and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey

30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilization of free electricity to farmers and related issues
40. Gender ration in schooling level- observation.

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs

Programs for School Children

1. Reading Skill Program (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Program on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Program on Socially relevant themes.

Programs for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Women's Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programs on Environment
10. Health and Hygiene

11. Hand wash programmes
12. Commemoration and Celebration of important days

Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programs

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like –
    i. Agriculture
    ii. Health
    iii. Marketing and Cooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. Revenue and Survey
    ix. Natural Disaster Management
    x. Irrigation
    xi. Law & Order
    xii. Excise and Prohibition
    xiii. Mines and Geology
    xiv. Energy

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.

- An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. **Preliminary Survey (One Week)**
   - A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
   - A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
   - The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.
2. **Community Awareness Campaigns (One Week)**
   Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.
3. **Community Immersion Programme (Three Weeks)**
   Along with the Community Awareness Programmes, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.
4. **Community Exit Report (One Week)**
   During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.
   Throughout the Community Service Project, a daily logbook need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.