
# GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE

## (AUTONOMOUS)

## NELLORE–524317(A.P) INDIA

## B.TECH

## IN

## ELECTRONICS & COMMUNICATION ENGINEERING

## COURSE STRUCTURE AND SYLLABI

## UNDER

## RG 22 REGULATIONS

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**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.

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## 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.

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| Semester - 5 (Theory-6, Lab-2, MC-1) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **Hours per week** | | | **Credits** |
| | | | | **L** | **T** | **P** | **C** |
| 1 | PCC | 22A0420T | Digital System Design through Verilog | 3 | 0 | 0 | 3 |
| 2 | PCC | 22A0215T | Control Systems Engineering | 3 | 0 | 0 | 3 |
| 3 | PCC | 22A0421T | Antennas & Microwave Engineering | 3 | 0 | 0 | 3 |
| 4 | PEC | | **Professional Elective-I** | 3 | 0 | 0 | 3 |
| 5 | OEC | | **Open Elective-I** | 3 | 0 | 0 | 3 |
| 6 | PCC (Lab) | 22A0426P | Digital System Design through Verilog Lab | 0 | 0 | 3 | 1.5 |
| 7 | PCC (Lab) | 22A0429P | Antennas & Microwave Engineering Lab | 0 | 0 | 3 | 1.5 |
| 8 | SC | 22A0029P | **Skill Advanced Course:** Soft Skills | 1 | 0 | 2 | 2 |
| 9 | MC | 22A0526 | **Mandatory Course:** Design Thinking and Innovation | 2 | 0 | 0 | 0 |
| | | 22A0433 | Evaluation of Community Service Project | 0 | 0 | 0 | 1.5 |
| | | | | | | **Total credits** | **21.5** |

| S. No. | Course Code | Name of the Professional Elective-I |
|---|---|---|
| 1 | 22A0422T | Data Communication &Networks |
| 2 | 22A0423T | Information Theory and Coding |
| 3 | 22A0424T | Industrial Electronics |
| 4 | 22A0425T | Computer Architecture & Organization |

| S. No. | Course Code | Name of the Open Elective-I |
|---|---|---|
| 1 | 22A0512T | Data base Management Systems |
| 2 | 22A0258T | Applications of Power Electronics To Power Systems |
| 3 | 22A0334Tc | Fundamentals of Drone Technology |
| 4 | 22A0149T | Building Materials |

| Category | Credits |
|---|---|
| Professional Core Courses (PCC) | 12 |
| Professional Elective Courses (PEC) | 3 |
| Open Elective Courses (OEC) | 3 |
| Skill Advanced Course (SC) | 2 |
| Summer Internship | 1.5 |
| Total | 21.5 |

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| DIGITAL SYSTEM DESIGN THROUGH VERILOG | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam. Marks** | **Exam Duration** | **Course Type** |
| **22A0420T** | **3:0:0** | **3** | **CIE:30**<br>**SEE:70** | **3 Hours** | **PCC** |

**Course Objectives:**

- To designing digital circuits, behaviour and RTL modeling of digital circuits using Verilog HDL
- To verifying these Models and synthesizing RTL models to standard cell libraries and FPGAs.
- The Students aims to practical experience by designing, modelling, implementing and verifying several digital circuits.
- To provide students with the understanding of the different technologies related to HDLs, construct, compile and execute Verilog HDL programs using provided

| **Syllabus** | Total Hours: 48 |
|---|---|
| **Unit –I::Introduction and Basics of Verilog HDL** | **10 Hrs** |

**Introduction to Verilog HDL:** Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Programming Language Interface, Module.

**Language Constructs and Conventions**: Introduction, Keywords, Identifiers, White Space, Characters, Comments, Numbers, Strings, Logic Values, Data Types, Scalars and Vectors, Operators.

| **Unit –II:: Gate Level Modeling and Data flow** | **10 Hrs** |
|---|---|

**Gate Level Modeling**: Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tristate Gates, Array of Instances of Primitives, Design of Flip-Flops with Gate Primitives, Gate Delay, Strengths and Contention Resolution, Net Types.

**Modeling at Dataflow Level:** Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vector, Operators.

| **Unit –III:: Behavioral Modeling** | **10 Hrs** |
|---|---|

**Behavioral Modeling:** Introduction, Operations and Assignments, 'Initial' Construct, Always construct, Assignments with Delays, 'Wait ‘Construct, Design at Behavioral Level, Blocking and Non Blocking Assignments, The 'Case' Statement, 'If' and 'if-Else' Constructs, 'Assign- De-Assign' Constructs, 'Repeat' Construct, for loop, 'The Disable' Construct, 'While Loop', Forever Loop, sequential and Parallel Blocks.

| **Unit –IV:: Switch Level Modeling** | **9 Hrs** |
|---|---|

**Switch Level Modeling:** Basic Transistor Switches, CMOS Switches, Bidirectional Gates, Time Delays with Switch Primitives, instantiation with strengths and delays, Switch level modeling for NAND, NOR and XOR.

| **Unit –V:: System Tasks, Functions & Compiler Directives & Sequential Circuit Description** | **9 Hrs** |
|---|---|

**System Tasks, Functions and Compiler Directives:** Parameters, Path Delays, Module Parameters, System Tasks and Functions, User Defined Primitives, Compiler directives.

**Sequential Circuit Description:** Sequential Models - Feedback Model, Capacitive Model, Implicit Model.

**Text Books:**

1. T.R. Padmanabhan, B Bala Tripura Sundari, Design through Verilog HDL, Wiley 2009.

2. 2. Verilog HDL - Samir Palnitkar, 2nd Edition, Pearson Education, 2009.

**References:**

1. Fundamentals of Digital Logic with Verilog Design - Stephen Brown,Zvonkoc Vranesic, TMH, 2nd Edition.
2. Zainalabdien Navabi, Verliog Digital System Design, TMH, 2nd Edition.
3. Advanced Digital Logic Design using Verilog, State Machines & Synthesis for FPGA - Sunggu Lee, Cengage Learning, 2012.
4. Advanced Digital Design with Verilog HDL - Michel D. Ciletti, PHI, 2009.

**Course Outcomes:**

After the completion of the course students will able to:

**CO1:** Describe Verilog HDL Design Digital circuits

**CO2:** Write behavior model of digital circuits

**CO3:** Write RTL models of digital circuits

**CO4:** Describe standard Cell Libraries and FPGAs

**CO5:** Synthesize RTL models to standard cell libraries and FPGAs

**CO6:** Implement RTL models on FPGAs and testing and verification

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## CONTROL SYSTEMS ENGINEERING

| Course Code | L:T:P | Credits | Exam. Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 22A0215T | 3:0:0 | 3 | CIE:30<br>SEE:70 | 3 Hours | PCC |

**Course Objectives:**

- Merits and demerits of open loop and closed loop systems; the effect of feedback
- The use of block diagram algebra and Mason's gain formula to find the overall transfer function
- Transient and steady state response, time domain specifications and the concept of Root loci
- Frequency domain specifications, Bode diagrams and Nyquist plots
- State space modelling of Control system

| Unit-I | Concept of Control System | 10 Hrs |
|---|---|---|

**Classification of control systems** - Open loop and closed loop control systems, Differences, Examples of control systems- Effects of feedback, Feedback Characteristics. Mathematical models Principle of operation of DC and AC Servo motor, Transfer function of DC servo motor - AC servo motor, Synchros.

**Transfer Function Representation:** Block diagram algebra, Determining the Transfer function from Block Diagrams, Signal flow graphs(SFG) - Reduction using Mason's gain formula Transfer function of SFG's.

| Unit –II | Time Response Analysis | 10 Hrs |
|---|---|---|

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, P, PI, PID Controllers.

| Unit –III | Stability Analysis in Time Domain | 10 Hrs |
|---|---|---|

**A) Stability Analysis in S-Domain**: The concept of stability – Routh-Hurwitz's stability criterion – qualitative stability and conditional stability – Limitations of Routh-Hurwitz's stability

B) **Root Locus Technique:** Concept of root locus - Construction of root locus, Effects of adding and zeros to G(s) H(s) on the root loci.

| Unit –IV | Frequency Response Analysis | 9 Hrs |
|---|---|---|

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 – Lag, Lead, Lag-Lead Compensator design in frequency Domain.

| Unit-V | State Space Analysis of Continuous Systems | 9 Hrs |
|---|---|---|

Concepts of state, state variables and state model, state models - 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.

**Text Books:**


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.

**References:**

1. Control Systems Principles & Design by M.Gopal, 4th Edition, Mc Graw 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, Mc Graw 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:**

After the completion of the course students will able to:

**CO1:** Understand the concepts of control systems feedback effect, mathematical modelling, and time response.

**CO2:** Apply the concepts of Block diagram reduction, Signal flow graph method for obtaining mathematical and Root locus, Bode, Nyquist, Polar plots for stability calculations.

**CO3:** Apply the concept of controllability and observability and demonstrate the use of these techniques.

**CO4:** Analyze time response analysis, error constants, and stability characteristics of a given mathematical model using different methods.

**CO5:** Design and develop different compensators, controllers and their performance evaluation for various conditions.

**CO6:** Implement different compensators and controllers in solving various engineering applications.

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| ANTENNAS & MICROWAVE ENGINEERING | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam. Marks** | **Exam Duration** | **Course Type** |
| **22A0421T** | **3:0:0** | **3** | **CIE:30<br>SEE:70** | **3 Hours** | **PCC** |

**Course Objectives:**

- To allow the student to understand the basic principles in antenna and micro wave system design.
- To make the student to gain knowledge in various antenna designs.
- To enable the student knowledge in the area of microwave components and antenna for practical applications.

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

**Introduction to Antennas:** Definition of antenna, Radiation Mechanism – single wire, two wire, dipoles, Antenna Parameters - Radiation Patterns, Main Lobe and Side Lobes, Beam widths, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Aperture Efficiency, Effective Height and length, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole– Current Distributions, Field Components, Radiated power, Radiation Resistance, Loop Antennas - Introduction, Small Loop, Comparison of far fields of small loop and short dipole, Radiation Resistances and Directives of small and large loops (Qualitative Treatment)

| **Unit –II** | **10 Hrs** |
|---|---|

**VHF, UHF and Micro wave Antennas:** Helical Antennas-Helical Geometry, Helix modes, Horn Antennas- Types, Fermat's Principle, Optimum Horns, Design considerations of Pyramidal Horns, Micro strip Antennas- Introduction, features, advantages and limitations, Rectangular patch antennas-Geometry and parameters, characteristics of Micro strip antennas, parabola reflectors-geometry, pattern characteristics, Feed Methods, Reflector Types - Related Features.

| **Unit –III** | **10 Hrs** |
|---|---|

**Antenna Arrays and propagation:** Arrays of 2 Isotropic sources- Different cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison, Arrays with Parasitic Elements-Yagi- Uda Arrays, Folded Dipoles & their characteristics Ground wave propagation Space wave propagation-Sky wave propagation(Qualitative treatment).

**Waveguides:** Introduction, Rectangular wave guides, Field expressions for TE and TM modes, Wave propagation in the guide, Phase and group velocities, Wave guide current and mode excitation.

| **Unit –IV** | **9 Hrs** |
|---|---|

**Microwave Components:** Introduction to scattering parameters and their properties, Hybrid Tees (H-plane, E-plane, Magic Tees), Hybrid ring, Directional Couplers – Bethe hole and Two-hole Couplers, Deriving Scattering matrix for H-plane, E-plane, Magic Tees.

**Micro wave Amplifiers and Oscillators:** Micro wave Tubes: Linear Beam Tubes–Two cavity Klystron amplifier -velocity modulation, bunching process, Reflex Klystron oscillator, Travelling Wave Tube (TWT) – Bunching process and amplification process (Qualitative treatment only).

Crossed Field Tubes–Magnetron oscillator, pi-mode operation, Hartree Condition.

| Unit –V | 9 Hrs |
|---|---|

**Micro wave Semi conductor Devices:** Gunn Oscillator – Principle of operation, Characteristics, Two valley model. Antennas and Microwave Measurements: Sources of errors, Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by comparison, Absolute and 3-Antenna Methods). Description of Microwave bench-different blocks and their features, errors and precautions, Measurement of attenuation, frequency, VSWR (low, medium, high), Impedance measurements.

**Textbooks:**

1. JohnD.Kraus, Ronald J. Marhefkaand Ahmad S. Khan, "Antennas and Wave propagation", TMH New Delhi, 4thEd, 2010.
2. SamuelY. Liao,"Micro wave devices and circuits", 3rdEdition,Pearson Publishing, 2003.

**References:**

1. R .E. Collin, "Foundations for micro wave engineering", 2ndEdition, JohnWiley,2002.
2. C.A. Balanis, "Antenna Theory-Analysis and Design", John Wiley & Sons, 2nd Edn. 2001.
3. M. Kulkarni, "Micro wave and Radar Engineering", Umesh Publications, 4th edition 2009.
4. G.S.NRaju, "AntennaandWavePropagation",PearsonEducationIndia,3rdEdition2009.

**Course Outcomes:**

After the completion of the course students will able to:

**CO1:** Understand the generation of radiation and basic concepts of dipole and loop Antennas

**CO2:** Analyze the Practical antenna design characteristics to meet the requirements of modern wireless communications.

**CO3:** Understand the uses of antenna arrays and waveguides for propagation of EM wave.

**CO4:** Analyze various microwave components and the principles of different microwave sources.

**CO5:** Gain knowledge on Micro wave Amplifiers and Oscillators.

**CO6:** Measure the different Parameters of antennas and propagation of microwaves through waveguides.

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## DATA COMMUNICATION AND NETWORKS

| Course Code | L:T:P | Credits | Exam. Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 22A0422T | 3:0:0 | 3 | CIE:30<br>SEE:70 | 3 Hours | PEC |

**Course Objectives:**

The student should be made to:

- Understand the division of network functionalities into layers.
- Be familiar with the components required to build different types of networks
- Be exposed to the required functionality at each layer
- Learn the flow control and congestion control algorithms

| Syllabus | Total Hours: 48 |
|---|---|

| Unit –I | 10 Hrs |
|---|---|

**Data Communications:** Components, protocols and standards, Network and Protocol Architecture, Reference Model ISO-OSI, TCP/IP-Overview, topology, transmission mode, digital to digital encoding, transmission media guided and unguided, Switching: Circuit switching(space-division, time division and space-time division), packet switching (virtual circuit and Data gram approach), message switching.

| Unit –II | 10 Hrs |
|---|---|

**Data Link Layer:** Design issues, Data Link Control and Protocols: Flow and Error Control, Stop-and wait ARQ. Sliding window protocol, Go-Back-N ARQ, Selective Repeat ARQ, HDLC, Point-to –Point Access: PPP Point –to- Point Protocol, PPP Stack.

| Unit –III | 10 Hrs |
|---|---|

**Medium Access Sub layer:** Channel allocation problem, Controlled Access, Channelization, multiple access protocols, IEEE standard 802.3 & 802.11 for LANS and WLAN, high-speed LANs, Bluetooth IEEE 802.16.Tokenring, Token Bus, FDDI based LAN, Network Devices-repeaters, hubs, switches bridges.

| Unit –IV | 9 Hrs |
|---|---|

**Network Layer:** Design issues, Routing algorithms, Congestion control algorithms, Host to Host Delivery: Internetworking, addressing and routing, IP addressing (class full & Classless), Subnet, Network Layer Protocols: ARP, IPV4, ICMP, IPV6 and ICMPV6.

| Unit –V | 9 Hrs |
|---|---|

**Transport Layer:** Process to Process Delivery: UDP; TCP, congestion control and Quality of service. Application Layer: Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP), file transfer (FTP), HTTP and WWW.

**Text Books:**


1. S. Tannenbum, D. Wetherall, ―Computer Networks‖, Prentice Hall, Pearson, 5thEd.
2. Behrouz A. Forouzan, ―Data Communications and Networking‖, Tata McGraw-Hill, 4th Ed


**References:**


1. Fred Halsall, ―Computer Networks‖, Addison – Wesley Pub. Co. 1996.
2. Larry L, Peterson and Bruce S. Davie, ―Computer Networks: A system Approach‖, Elsevier, 4thEd
3. Tomasi, ―Introduction To Data Communications & Networking‖, Pearson 7th impression2011.
4. William Stallings, ―Data and Computer Communications‖, Prentice Hall, Imprint of Pearson,

9thEd.

**Course Outcomes:**

After the completion of the course students will able to:

**CO1:** Understand the basics of data communication, networking, internet and their importance.

**CO2:** Analyze the services and features of various protocol layers in data networks.

**CO3:** Differentiate wired and wireless computer networks

**CO4:** Analyze TCP/IP and their protocols.

**CO5:** Understand the flow control and congestion control algorithms

**CO6:** Understand different internet devices and their functions.

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| INFORMATION THEORY AND CODING | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam. Marks** | **Exam Duration** | **Course Type** |
| **22A0423T** | **3:0:0** | **3** | **CIE:30<br>SEE:70** | **3 Hours** | **PEC** |

**Course Objectives:**

- To teach the basic parameters of Information, the concepts of source coding techniques and error control coding techniques.
- To transmit knowledge on Information theory and error control coding techniques to solve problems.
- To Introduce various source coding and channel coding techniques for error detection and error correction in the information bearing signals.
- To describe various systems for linear block codes and convolutional codes.

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

**Information Theory:** Introduction, Definition of Entropy, Conditional Entropy, Relative Entropy, Basic Properties of Entropy, Mutual Information, Information Inequalities, Problem solving. Block to Variable length Coding: Prefix-free Code – Coding a single Random Variable, Prefix- Free Code, Kraft Inequality, Bounds on optimal Code length – Coding a Single Random Variable, Rooted Tree with Probabilities, Shanon- Fano Coding – Free fix code, Coding an information Source, Huffman Coding, Example.

**Variable to Block Length Coding:** Proper message set, Assigning probabilities to K-ary rooted tree corresponding to a proper message set, Prefix free Coding of a proper message set, Tunstall message set, Tunstall coding.

| **Unit –II** | **10 Hrs** |
|---|---|

**Asymptotic Equi-partition Property** – Chebyshev inequality, Weak law of large numbers, Typical Sequences, Block to Block Coding of DMS: Consequences of Asymptotic Equipartition Property, Problem solving.

**Universal Source Coding:** Lempel –Ziv Algorithm, LZ – 77 Encoding and Decoding, Lempel – Ziv Welch (LZW) Algorithm, LZW Encoding, and Decoding.

Coding of Sources with memory, Channel Capacity, Noisy Channel Coding Theorem, Differential Entropy, Gaussian Channel, Rate Distortion Theory, Blahut – Arimoto Algorithm - problem solving.

| **Unit –III** | **10 Hrs** |
|---|---|

**Error Control Coding:** Introduction to Error Control Codes, Error Probability with Repetition in the Binary Symmetric Channel, Parity Check Bit Coding for Error Detection, Block Coding for Error Detection and Correction, The Hamming Distance, The upper bound of the Probability of Error with Coding, Soft Decision Decoding, Hard Decision Decoding.

| **Unit –IV** | **9 Hrs** |
|---|---|

**Linear Block Codes** – Introduction to Linear Block Codes, Syndrome and Error Detection, Encoding Block Codes, Decoding of Block Codes, Single Parity Check bit Code, Repeated Codes, Hadamard Code, Hamming Code, Cyclic Codes, Generator and Parity-Check Matrices of Cyclic Codes, Encoding and Decoding of Cyclic Codes, BCH codes, Reed-Solomon Code.

| **Unit –V** | **9 Hrs** |
|---|---|

**Convolutional Coding** – Code Generation, Decoding Convolutional Code – the Code Tree, Decoding in the presence of Noise, State and Trellis Diagrams, The Viterbi Algorithm, Comparison of Error Rates in Coded and Uncoded Transmission, Turbo Codes, LDPC codes, Hard and Soft Decision Decoding.

**Text Books:**

1. Thomas M.Cover, Joy A. Thomas, Elements of Information Theory, John Wiley & Sons, 2nd Edition, 2006.

2. Herbert Taub, Donald L Shilling, Goutam Saha, Principles of Communication Systems, 4th Edition, McGraw Hill, 2017.

**References:**

1. Shu Lin, Daniel J. Costello Jr., Error Control Coding, Pearson, Second Edition, 2013.
2. Simon Haykin, Communication Systems, John Wiley, 4th Edition, 2010.

**Course Outcomes:**

After the completion of the course students will able to:

**CO1:** Describe the basic parameters of Information, the concepts of source coding techniques, and Error Control coding techniques.

**CO2:** Apply the knowledge of Information theory and error control coding techniques to solve problems.

**CO3:** Analyze various source coding and channel coding techniques for error detection and error correction in the information bearing signals.

**CO4:** Compare various block to variable length coding and variable to block length coding techniques for merits and demerits. Also compare the performance of linear block codes and convolutional codes.

**CO5:** Design various systems for linear block codes and convolutional codes.

**CO6:** Implement the various source coding methods to improve the efficiency of information theory.

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## INDUSTRIAL ELECTRONICS

| Course Code | L:T:P | Credits | Exam. Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 22A0424T | 3:0:0 | 3 | CIE:30<br>SEE:70 | 3 Hours | PEC |

**Course Objectives:**

- Describe semi-conductor devices (such as PN junction diode & Transistor) and their switching characteristics.
- Understand the characteristics of AC to DC converters.
- Understand about the practical applications Electronics in industries.
- Describe the ultrasonic and its application.

| Syllabus | Total Hours: 48 |
|---|---|

**Unit –I** — **10 Hrs**

Scope of industrial Electronics, Semiconductors, Merits of semiconductors, crystalline structure, Intrinsic semiconductors, Extrinsic semiconductors, current flow in semi conductor, Open circuited p-n junction, Diode resistance, Zener diode, Photo conductors and junction photo diodes, Photo voltaic effect, Light emitting diodes(LED).

**Unit –II** — **10 Hrs**

Introduction, The junction transistor, Conventions for polarities of voltages and currents, Open circuited transistor, Transistor biased in the active region, Current components in transistors, Currents in a transistor, Emitter efficiency, Transport factor and transistor-α, Dynamic emitter resistance, Transistor as an amplifier, Transistor construction, Letter symbols for semiconductor Devices, Characteristic curves of junction transistor in common configuration, static characteristic curves of PNP junction transistor in common emitter configuration, The transistor in common collector Configuration.

**Unit –III** — **10 Hrs**

**AC to DC converters-** Introduction, Classification of Rectifiers, Half wave Rectifiers, Full wave Rectifiers, Comparison of Half wave and full wave rectifiers, Bridge Rectifiers, Bridge Rectifier meter, Voltage multiplying Rectifier circuits, Capacitor filter, LC Filter, Metal Rectifiers, Regulated Power Supplies, Classification of Voltage Regulators, Short period Accuracy of Regulators, Long period .Accuracy of Voltage Regulator, Principle of automatic voltage Regulator, Simple D.C. Voltage stabilizer using Zener diode, D.C. Voltage Regulators, Series Voltage Regulators, Complete series voltage regulator circuit, Simple series voltage regulator.

**Unit –IV** — **9 Hrs**

**Resistance welding controls:** Introduction, Resistance welding process, Basic Circuit for A.C. resistance welding, Types of Resistance welding, Electronic welding control used in Resistance welding, Energy storage welding. Induction heating: Principle of induction heating, Theory of Induction heating merits of induction heating, Application of induction heating, High frequency power source of induction heating. Dielectric heating: Principle of dielectric heating, theory of dielectric heating, dielectric properties of typical materials, electrodes used in dielectric heating, method of coupling of electrodes to the R.F. generator, Thermal losses in Dielectric heating, Applications.

**Unit –V** — **9 Hrs**

**Ultrasonics:** Introduction, Generation of Ultrasonic waves, Application of Ultrasonic waves, Ultrasonic stroboscope, ultrasonic as means of communication, ultrasonic flaw detection, Optical image on non-homogeneities, ultrasonic study of structure of matter, Dispersive study of structure of matter, Dispersive and colloidal effect of Ultrasonic, Coagulating action of Ultrasonic, separation of mixtures by ultrasonic waves, cutting and machining of hard materials by ultrasonic vibrations, Degassing of liquids by ultrasonic waves, Physio-chemical effects of ultrasonics, chemical effects of

ultrasonics, Thermal effects of ultrasonics, soldering and welding by ultrasonics, Ultrasonic Drying

**Textbooks:**

1. Fundamentals of Industrial Electronics, Bogdan M Wilamowski, J David irwin, 2nd Edition, 2011.
2. Industrial and Power Electronics – G. K. Mithal and Maneesha Gupta, Khanna Publishers, 19th Ed., 2003.
3. Integrated Electronics – J. Millman and C.C Halkias, McGraw Hill, 1972.

**References:**

1. Electronic Devices and circuits – Theodore. H. Bogart, Pearson Education, 6th Edn., 2003.
2. Integrated Circuits and Semiconductor Devices – Deboo and Burroughs, ISE

**Course Outcomes:**

After the completion of the course students will able to:

**CO1:** Understand the semi-conductor devices and their switching characteristics.

**CO2:** Apply the Ultrasonic waves with different applications.

**CO3:** Understand the working of Transistor and its different configurations.

**CO4:** Analyze the thermal effects of ultrasonic, soldering and welding by ultrasonic, ultrasonic Drying in the industry; interpret the characteristics of AC to DC converters.

**CO5:** Develop the practical applications Electronics in industries.

**CO6:** Apply the process of Resistance welding, Induction heating and Dielectric heating in the industry.

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| COMPUTER ARCHITECTURE & ORGANIZATION | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam. Marks** | **Exam Duration** | **Course Type** |
| **22A0425T** | **3:0:0** | **3** | **CIE:30**<br>**SEE:70** | **3 Hours** | **PEC** |

**Course Objectives:**

The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.

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

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture. Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit. Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

| **Unit –II** | **10 Hrs** |
|---|---|

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit. Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

| **Unit –III** | **10 Hrs** |
|---|---|

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation. Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

| **Unit –IV** | **9 Hrs** |
|---|---|

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access. Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

| **Unit –V** | **9 Hrs** |
|---|---|

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics. Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor. Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

**Textbooks:**

1. Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI.

**References:**

1. Computer Organization – Car Hamacher, ZvonksVranesic, SafeaZaky, V th Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
3. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

**Course Outcomes:**

After the completion of the course students will able to:

**CO1:** Understand the basics of instructions sets and their impact on processor design.

**CO2:** Demonstrate an understanding of the design of the functional units of a digital computer system.

**CO3:** Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.

**CO4:** Design a pipeline for consistent execution of instructions with minimum hazards.

**CO5:** Recognize and manipulate representations of numbers stored in digital computers.

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**DATABASE MANAGEMENT SYSTEMS**
**(Common to CE,EEE,ME and ECE)**

| Course Code | L:T:P:S | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 22A0512T | 3:0:0:0 | 3 | CIE: 30<br>SEE:70 | 3 Hours | OEC |

**Course Objectives:**

This course will enable students to:

- To teach the role of database management system in an organization.
- To design databases using data modeling and Logical database design techniques.
- To construct database queries using relational algebra and calculus and SQL.
- To explore implementation issues in database transaction.
- To familiarize database security mechanisms.

| Syllabus | | Total Hours:48 |
|---|---|---|
| **Unit -I** | **Introduction to Database concepts and Modeling** | **10Hrs** |

**Conceptual Modeling Introduction:** Introduction to Data bases, Purpose of Database Systems, View of Data, Data Models, Database Languages, Database Users, Database Systems architecture.

**The Entity-Relationship Model:** Overview of Database Design, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Conceptual Design with the ER Model.

| | | |
|---|---|---|
| **Unit -II** | **Relational Model, Relational Algebra** | **9Hrs** |

**Relational Model:** Introduction to the Relational Model – Integrity Constraints over Relations, Enforcing Integrity constraints, querying relational data, Logical data base Design, Views.

**Relational Algebra:** Introduction to Relational algebra, selection and projection, set operations, renaming, joins, division.

| | | |
|---|---|---|
| **Unit -III** | **SQL** | **10Hrs** |

**SQL:** Basic form of SQL Query, DDL, DML queries, Views in SQL, Joins, Nested & Correlated queries, Operators, predefined functions, Aggregate Functions.

**PL/SQL**: Introduction, Functions & Procedures, Triggers, Cursors.

| | | |
|---|---|---|
| **Unit -IV** | **Normalization** | **9Hrs** |

**Relational database design:** Introduction, Functional Dependencies (FDs), Normalization for relational databases: 1NF, 2NF, 3NF and BCNF, Basic definitions of Multi Valued Dependencies, 4NF and 5NF.

| | | |
|---|---|---|
| **Unit -V** | **Transaction Management &Concurrency Control and Recovery** | **10Hrs** |

**Transaction Management:** Transaction processing, Transaction Concept, Transaction States, Implementation of Atomicity and Durability, Concurrent Executions.

**Concurrency Control:** Lock-Based Protocols, Timestamp- Based Protocols, Validation-Based Protocols, Multiple Granularities.

**Recovery:** Failure Classification, Recovery and Atomicity, Log-Based Recovery.

**Text Books:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 6th Edition, Tata McGraw-Hill Publishing Company,2017.
2. Raghu Ramakrishnan, Database Management System, 3rd Edition, Tata McGraw-Hill Publishing Company, 2014.

**Reference Books:**

1. Peter Rob, A.Ananda Rao, Corlos Coronel, Database Management Systems (for JNTU), Cengage Learning, 2011.
2. Hector Garcia Molina, Jeffrey D. Ullman, Jennifer Widom, Database System Implementation, 1st Edition, Pearson Education, United States, 2000.
3. E. Ramez and Navathe, Fundamental of Database Systems, 7th Edition, Pearson Education
4. R.P. Mahapatra & Govind Verma, Database Management Systems, Khanna Publishing House, 2016.
5. Carlos Coronel and Steven Morris, Database Systems: Design, Implementation, and Management, 12th edition, Cengage Learning,2016.
6. John V. ,Absolute beginner's guide to databases, Petersen, QUE

**Web Resources:**

1. https://www.coursera.org/learn/database-management
2. https://www.coursera.org/learn/sql-data-science
3. https://www.w3schools.com/sql/
4. https://www.youtube.com/watch?v=fHAfc7Hjq28&list=PLWPirh4EWFpGrpcMfZ6UcdI786QdtSxV8
5. https://www.youtube.com/watch?v=HwmEcudlv44&list=PL4OCRJojkV1jN-Ed6RkQpWfBvqe0utRd6
6. http://www.w3schools.in/dbms/
7. https://www.geeksforgeeks.org/dbms/
8. https://www.javatpoint.com/dbms-tutorial
9. https://www.edureka.co/blog/dbms-tutorial/

**Course Outcomes (CO):**

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

**CO1:** Understand the Basic Concepts of Database languages, Relational model, SQL.

**CO2:** Choose the specific Data models for large enterprise database design.

**CO3:** Analyze the data efficiently through SQL instructions.

**CO4:** Apply Normal forms on database for eliminating the redundancy.

**CO5:** Demonstrate the Basic Concepts of transaction management techniques.

**CO6:** Apply concurrency control techniques for Database recovery.

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## APPLICATIONS OF POWER ELECTRONICS TO POWER SYSTEMS
**(Common to all Except EEE)**

| Course Code | L:T:P | Credits | Exam marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 22A0258T | 3:0:0 | 3 | CIE:30<br>SEE:70 | 3 Hours | OEC |

**Course Objectives:**

Student will be able to,

1. To develop the understanding of uncompensated lines and their behavior under heavy loading conditions.
2. To understand the concept and importance controllable parameters of FACTS controllers.
3. To emphasize the objectives of Shunt compensation, and basic operation of SVC and STATCOM.

| Syllabus | | Total Hours: 49 Hrs |
|---|---|---|
| **Unit-I** | **General System considerations and FACTS** | **10 Hrs** |

Transmission Interconnections, Flow of Power in an AC System, Power Flow and Dynamic Stability Considerations of a Transmission Interconnection, principles of series and shunt compensation, Basic Types of FACTS Controllers, Benefits from FACTS, Application of FACTS.

| Unit-II | Shunt Compensators | 8 Hrs |
|---|---|---|

Objectives of Shunt Compensation, Midpoint Voltage Regulation for Line Segmentation, End of Line Voltage Support to Prevent Voltage Instability, improvement of Transient Stability, Power Oscillation Damping, Static Var Compensators, SVC and STATCOM, The Regulation Slope, Transfer Function and dynamic Performance, Transient Stability, Enhancement and Power Oscillation Damping.

| Unit -III | Series Compensators | 10 Hrs |
|---|---|---|

Objectives of Series Compensation, concept of series capacitive compensation, voltage stability, improvement of transient stability, power oscillation damping, GTO thyristor controlled series capacitor, Thyristor controlled series capacitor, SSSC.

| Unit -IV | Combined Compensators | 10 Hrs |
|---|---|---|

Introduction, Unified power flow controller, basic operating principles, independent real and reactive power flow control, and control structure, basic control system for P and Q control.

| Unit -V | Ac Voltage Controllers & Cyclo Converters | 10 Hrs |
|---|---|---|

Power quality problems, harmonics, harmonic creating loads, harmonic power flow, and mitigation of harmonics, filters, passive filters, active filters, shunt, series and hybrid filters.

**Textbooks:**


1. Narain G. Hingorani, Laszlo Gyugyi, Understanding FACTS, IEEE press
2. Roger. C. Dugan, Mark. F. Mc Granagham, Surya Santoso, H. Wayne Beaty, Electrical Power Systems Quality, McGraw Hill,2003


**References:**


1. Y. H. Song, A. T. Johns, Flexible A. C. Transmission System, IEE, London, 1999Edition, Pearson, 2010.


**Course Outcomes(CO):**

At the end of studying the course, the student should be able to:

**CO1:** Choose proper controller for the specific application based on system requirements
**CO2:** Understand various systems thoroughly and their requirements
**CO3:** Interpret the control circuits of Shunt Controllers SVC & STATCOM for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping

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| FUNDAMENTALS OF DRONE TECHNOLOGY | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **L:T:P** | **Credits** | **Exam marks** | **Exam Duration** | **Course Type** |
| **22A0334Tc** | **2: 1:0** | **3** | **CIE:30<br>SEE:70** | **3 Hours** | **OEC** |

**Course Objectives:**

The course should enable the students to

- To make the students to understand the basic concepts of UAV drone systems.
- To introduce the stability and control of an aircraft

| **Syllabus** | | **Total Hours: 50** |
|---|---|---|
| **UNIT-I** | **Introduction to Drones** | **10 Hrs** |
| Introduction to Unmanned Aircraft Systems, History of UAV drones, classification of drones, System Composition, applications | | |
| **UNIT-II** | **Design of UAV Drone Systems** | **10Hrs** |
| Introduction to Design and Selection of the System, Aerodynamics and Airframe Configurations, Characteristics of Aircraft Types, Design Standards and Regulatory Aspects-India Specific, Design for Stealth. | | |
| **UNIT-III** | **Avionics Hardware of Drones** | **10Hrs** |
| Autopilot, AGL-pressure sensors servos-accelerometer –gyros-actuators- power supply-processor, integration, installation, configuration. | | |
| **UNIT-IV** | **Communication, Payloads and Controls** | **10Hrs** |
| Communication, Payloads and Controls: Payloads, Telemetry, Tracking, controls-PID feedback, radio control frequency range, modems, memory system, simulation, ground test-analysis-trouble shooting | | |
| **UNIT-V** | **Navigation and Testing** | **10Hrs** |
| Navigation and Testing: Waypoints navigation, ground control software, System Ground Testing, System In-flight Testing, Future Prospects and Challenges | | |

**Textbooks:**


1. Reg Austin "Unmanned Aircraft Systems UAV design, development and deployment", Wiley, 2010.
2. Robert C. Nelson, Flight Stability and Automatic Control, McGraw-Hill, Inc, 1998.
3. Kimon P. Valavanis, "Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy", Springer, 2007


**Reference Books:**


1. Paul G Fahlstrom, Thomas J Gleason, "Introduction to UAV Systems", UAV Systems, Inc, 1998
2. Dr. Armand J. Chaput, "Design of Unmanned Air Vehicle Systems", Lockheed Martin Aeronautics.

**Course Outcomes(CO):**

At the end of studying the course, the student should be able to:

**CO1:** Understand the Concept of UAV, its components and its known applications.

**CO2:** Identify the type of drone and design a drone for a given application/specification.

**CO3:** Ability to design UAV drone system

**CO4:** To understand working of different types of engines and its area of applications.

**CO5:** To understand static and dynamic stability dynamic instability and control concepts

**CO6:** To know the loads taken by aircraft and type of construction and also construction materials.

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**BUILDING MATERIALS**

**(ME, CSE, AI&ML, CS, DS, ECE, EEE)**

| Course Code | L:T:P | Credits | Exam marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 22A0149T | 3:1:0:0 | 3 | CIE:30<br>SEE:70 | 3 Hours | OEC |

**Course Objectives:**

- To identify the traditional materials that are used for building constructions.
- To explain basic concepts of building components such as stair case and masonry
- To know the causes of dampness in structures and its preventive measures
- To understand the building rules, building bye laws and acoustics of building

| Syllabus | | Total Hours: 48 |
|---|---|---|
| **Unit-I** | **MATERIALS** | **9 Hrs** |
| Traditional materials: Stones- Types of stone masonry -Brick-types of brick masonry- lime Cement – Timber – Seasoning of timber - their uses in building works | | |
| **Unit-II** | **BUILDING COMPONENTS** | **9 Hrs** |
| Lintels, Arches and Vaults – Staircases, Lifts – Types. Different types of flooring-Concrete, Mosaic, Terrazo floors; Different types of roofs- Pitched, Flat and Curved Roofs. Lean-to-Roof, Coupled Roofs, Trussed roofs - King and Queen Post Trusses. Doors & Windows- Types and Specifications | | |
| **Unit -III** | **DAMPNESS** | **10 Hrs** |
| Dampness and its prevention: Causes of dampness- ill effects of dampness-requirements of an ideal material for damp proofing-materials for damp proofing –methods of damp proofing. | | |
| **Unit -IV** | **BUILDING PLANNING** | **10 Hrs** |
| Elements of building planning- basic requirements-orientation-planning for energy efficiency-planning based on utility-other requirements | | |
| **Unit -V** | **BUILDING RULES AND BYE-LAWS** | **10 Hrs** |
| Zoning regulations; Regulations regarding layouts or subdivisions; Building regulations; Rules for special type of buildings; Calculation of plinth, floor and carpet area; Floor space index. Building Information System | | |

**Textbooks:**


1. Building Drawing by M.G. Shah, C.M. Kale and S.Y. Patki, Tata McGraw-Hill, New
2. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, ‚Building Construction' - Laxmi Publications (P) Ltd., New Delhi


**Reference Books:**


1. Building Materials, S. K. Duggal, New Age International Publications.
2. N. Kumaraswamy, A. Kameswara Rao, building planning and drawing, 7th Ed, Charotar


E-resources:

1 http://nptel.ac.in/courses/105104103/

2. http://www.academicpub.org/jwrhe/

3. http://www.peo.on.ca/index.php/ci_id/21843/la_id/1

**Course Outcomes(CO):**

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

**CO1:** To understand the characteristics of different building materials.

**CO2:** Differentiate brick masonry, stone masonry construction and bonds used in construction of walls of buildings.

**CO3:** To know about the causes of dampness in buildings and its ill effects.

**CO4:** To understand the principles of planning in buildings.

**CO5:** Describe capable of understanding building rules.

**CO6:** Acquire the knowledge about bye-laws and building elements.

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## DIGITAL SYSTEM DESIGN THROUGH VERILOG LAB

| Course Code | L:T:P | Credits | Exam. Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 22A0426P | 0:0:3 | 1.5 | CIE:30<br>SEE:70 | 3 Hours | PCC |

**Course Objectives:**

- To understand and develop HDL(Verilog) source code for the given problem/experiment
- To analyze the obtained results of the given experiment/problem
- To simulate the given circuit with suitable simulator and verify the results
- To understand how to use FPGA/CPLD hardware tools in the lab
- To design and implement the experiments using FPGA/CPLD hardware tools

**Syllabus**

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

1. Realization of Logic gates
2. Design and Implementation of an Inverter
3. Design and Implementation of Full adder.
4. Design and Implementation of Full Subtractor
5. Design and Implementation of 4-bitcomparator.
6. Design and Implementation of 4-bit ripple carry and carry look ahead adder
7. Design and Implementation of 16:1 mux through 4:1 mux
8. Design and Implementation of 3:8 decoder realization through 2:4 decoder
9. Design and Implementation of 8:3 encoder
10. Design and Implementation of 8-bit parity generator and checker
11. Design and Implementation of different Flip-Flops
12. Design and Implementation of 8 bit up-down counter
13. Design and Implementation of 4bit sequence detector through Mealy and Moore state machines.

**Software Required:**

i)FPGA Programming Software like Xilinx Vivado / Altera (Intel) / Cypress / Equivalent Industry Standard Software

ii)Personal computer system with necessary software to run the programs and to implement

**Course Outcomes(CO):**

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

**CO1:** Understand HDL(Verilog) source code for the given problem/experiment

**CO2:** Develop HDL(Verilog) source code for the given problem/experiment

**CO3:** Analyze the obtained results of the given experiment/problem

**CO4:** Simulate the given circuit with suitable simulator and verify the results

**CO5:** Understand how to use FPGA/CPLD hardware tools in the lab

**CO6:** Design and implement the experiments using FPGA/CPLD hardware tools

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## ANTENNAS & MICROWAVE ENGINEERING LAB

| Course Code | L:T:P | Credits | Exam. Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 22A0429P | 0:0:3 | 1.5 | CIE:30<br>SEE:70 | 3 Hours | PCC |

**Course Objectives:**

- To make students to understand various antennas
- To understand the working of different micro wave components and verify characteristics using micro wave bench setup.

**Syllabus**

**Part-A: Antennas Lab**

- To analyze the characteristics of Simple Dipole λ/2 and λ/4 Antenna
- To analyze the variation in the Radiation Strength at given distance from Antenna
- To analyze the Reciprocity Theorem for Antennas
- To study Folded Dipole λ/2Antenna
- Study of Yagi Uda 3element Folded Dipole, 5element folded dipole.
- To analyze the characteristics of micro strip antennas
- To analyze the characteristics and radiation pattern of broad side and end fire arrays.

**Part-B: Micro wave Engineering lab**

- Reflex Klystron Characteristics.
- Gunn Diode Characteristics.
- Directional Coupler Characteristics.
- VSWR Measurement.
- Measurement of Wave Guide Parameters.
- Measurement of Scattering Parameters of a Magic Tee.
- Attenuation Measurement.
- Microwave Frequency Measurement

NOTE: At least 5 Experiments from each section must be done in the semester.

**Course Outcomes:**

After the completion of the course students will able to:

**CO1:** Analyze performance characteristics of Antennas

**CO2:** Understand the working, different microwave components and sources in a microwave bench

**CO3:** Verify the characteristics of various microwave components using microwave bench setup.

**CO4:** Verify Theorems applicable for antennas

**CO5:** Measure scattering parameters of microwave components.

**CO6:** Measure Attenuation and frequency of microwave.

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## SOFT SKILLS

| Course Code | L:T:P | Credits | Exam. Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
| 22A0029P | 1:0:2 | 2 | CIE:30<br>SEE:70 | 3Hours | SC |

**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 develop leadership skills and organizational skills through group activities.
- To function effectively with heterogeneous teams.

**Syllabus** **Total Hours:45**

| Unit -I | Soft Skills & Communication Skills | 9Hrs |
|---|---|---|

Introduction, meaning, significance of soft skills –Vital Components of communication skills - Inter-personal skills - Verbal and Non-verbal Communication.

**Activities:** Narration about self- strengths and weaknesses- clarity of thought - Interpersonal Skills- Group Discussion – Debate – Mutual Understanding - 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- Negotiation skills –Role Play- Non-verbal communication – Public speaking – Mock interviews – Anchoring Skills.

| Unit -II | Critical Thinking | 9Hrs |
|---|---|---|

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking.

**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.

| Unit -III | Problem Solving & Decision Making | 9Hrs |
|---|---|---|

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Methods of decision making – 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 -IV | Emotional Intelligence & Stress Management | 9Hrs |
|---|---|---|

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, and 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** | **Leadership Skills** | **9Hrs** |
|---|---|---|

Team-Building – Decision-Making – Accountability – Planning – Public Speaking – Motivation – Risk Taking - Team Building - Time Management.

**Activities:** Forming group with a consensus among the participants- choosing a leader- encouraging the group members to express views on leadership- democratic attitude- sense of sacrifice – sense of adjustment – vision – accommodating nature- eliciting views on successes and failures of leadership using the past knowledge and experience of the participants, Public Speaking, Activities on Time Management, Motivation, Decision Making, Group discussion etc.

**Text Books:**

1. Personality Development and Soft Skills (English, Paperback, MitraBarunK.)Publisher: Oxford University Press; Pap/Cdr edition (July 22, 2012)
2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha Kapoor Publisher : I K International Publishing House; 0 edition (February 28, 2018)

**References:**

1. Soft skills: personality development for life success by Prashant Sharma, BPB publications, 2018.
2. Soft Skills By Alex K. Published by S.Chand
3. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, Sangeetha Sharma Published by Wiley.
4. Communication Skills and Soft Skills (Hardcover, A. Sharma) Publisher: Yking books
5. SOFT SKILLS for a BIG IMPACT (English, Paperback, RenuShorey) Publisher: Notion Press .
6. Life Skills Paperback English Dr. Rajiv Kumar Jain, Dr. Usha Jain Publisher: Vayu Education of India.

**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

**Course Outcomes:**

After the completion of the course students will able to :

**CO1:** Memorize various elements of effective communicative skills.

**CO2:** Interpret people at the emotional level through emotional intelligence.

**CO3:** Apply critical thinking skills in problem solving.

**CO4:** Analyze the needs of an organization for team building.

**CO5:** Judge the situation and take necessary decisions as a leader.

**CO6:** Develop social and work-life skills as well as personal and emotional well-being.

**GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE**
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**
**B. Tech ECE – RG 22 Regulation**

**DESIGN THINKING AND INNOVATION**
**(Common to CSE, AIML, CS, DS, CE, EEE, ME and ECE )**

| Course Code | L:T:P | Credits | Exam Marks | Exam Duration | Course Type |
|---|---|---|---|---|---|
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**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 | | Total Hours:48 |
|---|---|---|
| **Unit -I** | **Introduction to Design Thinking** | **9Hrs** |

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 | 9Hrs |
|---|---|---|

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, brain storming, 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 | 10Hrs |
|---|---|---|

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 | 10Hrs |
|---|---|---|

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 | 10Hrs |
|---|---|---|

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.

**Text Books:**


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

**Reference Books:**

1. Design Thinking in the Classroom by David Lee, Ulysses press
2. Design the Future, by Shrrutin N Shetty, Norton Press
3. Universal principles of design- William lidwell, kritinaholden, Jill butter.
4. The era of open innovation – chesbrough.H

**Course Outcomes (CO):**

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

**CO1:** Define the concepts related to design thinking.

**CO2:** Explain the fundamentals of Design Thinking and innovation

**CO3:** Apply the design thinking techniques for solving problems in various sectors.

**CO4:** Analyze to work in a multidisciplinary environment

**CO5:** Evaluate the value of creativity

**CO6:** Formulate specific problem statements of real time issues