DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

COURSE STRUCTURE & SYLLABUS M.Tech ECE Common for
I. Digital Electronics & Communication Engineering (DECE)
II. Digital Electronics & Communication Systems (DECS)
III. Electronics & Communication Engineering (ECE)

Programme
(Applicable for batches admitted from 2019-2020)
### I Semester

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course Type/Code</th>
<th>Course Name</th>
<th>Teaching Scheme</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Core 1</td>
<td>Digital System Design</td>
<td>L 3 T 0 P 0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Core 2</td>
<td>Digital Data Communications</td>
<td>L 3 T 0 P 0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Prog. Specific Elective</td>
<td>Elective I</td>
<td>L 3 T 0 P 0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Transform Techniques</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. VLSI Technology and Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Radar Signal Processing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Prog. Specific Elective</td>
<td>Elective II</td>
<td>L 3 T 0 P 0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Statistical Signal Processing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Optical Communication Technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Network Security &amp; Cryptography</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Lab 1</td>
<td>System Design Using Verilog HDL Laboratory</td>
<td>L 0 T 0 P 4</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Lab 2</td>
<td>Data Communications Laboratory</td>
<td>L 0 T 0 P 4</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Research Methodology and IPR</td>
<td>L 2 T 0 P 0</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Aud 1</td>
<td>Audit Course 1</td>
<td>L 2 T 0 P 0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total Credits</td>
<td>L 16 T 0 P 8</td>
<td>18</td>
</tr>
</tbody>
</table>

### II Semester

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course Type/Code</th>
<th>Name of the Subject</th>
<th>Teaching Scheme</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Core 3</td>
<td>Image and Video Processing</td>
<td>L 3 T 0 P 0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Core 4</td>
<td>Wireless Communications and Networks</td>
<td>L 3 T 0 P 0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Prog. Specific Elective</td>
<td>Elective III</td>
<td>L 3 T 0 P 0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. CMOS Analog &amp; Digital IC Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Advanced Computer Architecture</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Soft Computing Techniques</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Prog. Specific Elective</td>
<td>Elective IV</td>
<td>L 3 T 0 P 0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. DSP Processors and Architectures</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. EMI/EMC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Object Oriented Programming</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Lab 1</td>
<td>Advanced Communications Laboratory</td>
<td>L 0 T 0 P 4</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Lab 2</td>
<td>Advanced digital Image &amp; video processing Laboratory</td>
<td>L 0 T 0 P 4</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Mini Project</td>
<td>L 0 T 0 P 4</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Aud 2</td>
<td>Audit Course 2</td>
<td>L 2 T 0 P 0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total Credits</td>
<td>L 14 T 0 P 12</td>
<td>18</td>
</tr>
</tbody>
</table>
### III Semester

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course Type/Code</th>
<th>Subject</th>
<th>Teaching Scheme</th>
<th>Credits</th>
</tr>
</thead>
</table>
| 1     | Prog. Specific Elective | a) Detection & Estimation Theory  
                    | b) Advanced Digital Signal Processing  
                    | c) Coding Theory and Applications | 3 0 0 | 3 |
| 2     | Open Elective | a) Business Analytics  
                    | b) Industrial Safety  
                    | c) Operations Research  
                    | d) Cost Management of Engineering Projects  
                    | e) Composite Materials  
                    | f) Waste to Energy | 3 0 0 | 3 |
| 3     | Dissertation | Dissertation Phase – I | 0 0 20 | 10 |
|       | **Total** | | **6 0 20** | **16** |

### IV Semester

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course Code</th>
<th>Subject</th>
<th>Teaching Scheme</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dissertation</td>
<td>Dissertation Phase – II</td>
<td>32 0 0</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td></td>
<td><strong>-- -- 32</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

**Audit course 1 & 2**

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.
OBJECTIVES:
The main objectives of this course are given below:
1. The basic concepts of K-map, tabular method, QM method are revised and higher order minimization techniques like CAMP algorithm and Cubical operations are explained.
2. PLA folding using COMPACT algorithms studied for various cases.
3. ASM charts are revised and design techniques of digital circuit realization are explained.
4. Digital system design is approached using CPLD, FPGA and ASIC.
5. Fault Diagnosis in Combinational Circuits are performed using various techniques like fault detection test, path sensitization method and Boolean difference method, Kohavi algorithm.
6. Fault Diagnosis in sequential circuits is performed using Circuit test approach, Hamming Experiments, synchronizing experiments, distinguishing and adaptive distinguishing experiments on different cases.

UNIT-I: Minimization Procedures and CAMP Algorithm:
Review on minimization of switching functions using tabular methods, k-map, QM algorithm, CAMP-I algorithm, Phase-I: Determination of Adjacencies, DA, CSC, SSMs and EPCs,, CAMP-I algorithm, Phase-II: Passport checking, Determination of SPC, CAMP-II algorithm: Determination of solution cube, Cube based operations, determination of selected cubes are wholly within the given switching function or not, Introduction to cube based algorithms.

UNIT-II: PLA Design, Minimization and Folding Algorithms:
Introduction to PLDs, basic configurations and advantages of PLDs, PLA-Introduction, Block diagram of PLA, size of PLA, PLA design aspects, PLA minimization algorithm(IISc algorithm), PLA folding algorithm(COMPACT algorithm)-Illustration of algorithms with suitable examples.

UNIT -III: Design of Large Scale Digital Systems:
Algorithmic state machine charts-Introduction, Derivation of SM Charts, Realization of SM Chart, control implementation, control unit design, data processor design, ROM design, PAL design aspects, digital system design approaches using CPLDs, FPGAs and ASICs.

UNIT-IV: Fault Diagnosis in Combinational Circuits:
Faults classes and models, fault diagnosis and testing, fault detection test, test generation, testing process, obtaining a minimal complete test set, circuit under test methods- Path sensitization method, Boolean difference method, properties of Boolean differences, Kohavi algorithm, faults in PLAs, DFT schemes, built in self-test.

UNIT-V: Fault Diagnosis in Sequential Circuits:
Fault detection and location in sequential circuits, circuit test approach, initial state identification, Hamming experiments, synchronizing experiments, machine identification, distinguishing experiment, adaptive distinguishing experiments.
TEXT BOOKS:
1. Logic Design Theory-N. N. Biswas, PHI
3. Digital system Design using PLDd-Lala

REFERENCE BOOKS:

OUTCOMES:
At the end of this course the student can able to:
1. Understand the basic concepts of a Karnaugh Map (“K-map”) for a 2-, 3-, 4-, or 5-variable logic function and to identify the prime implicates, essential prime implicates, and nonessential prime implicates of a function depicted on a K-map.
2. Perform the minimization of a Boolean function using tabular method, QM algorithm and CAMP algorithm and determine the Adjacencies, DA, CSC, SSMs, EPCs and SPCs.
3. Perform the minimization of PLA using IISc algorithm and folding using COMPACT algorithm.
4. Can design a digital circuit by steps involving ASM chart.
6. Understand the digital system design approaches using CPLDs, FPGAs and ASICs.
8. Perform fault diagnosis in sequential circuits.
Course objectives
The main objectives of this subject are:
1. Different modulation techniques to improve the bandwidth and their properties.
2. Networking and different protocol systems.
3. Error estimation and correction, asynchronous and synchronous protocols.
4. Multiplexing techniques, different networking connections and interfacing devices.
5. Multiple access techniques and analysis.

UNIT -I:
Digital Modulation Schemes:
BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:
Basic Concepts of Data Communications, Interfaces and Modems:

UNIT -III:
Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code
Data Link Control: Line Discipline, Flow Control, Error Control

UNIT -IV:
Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.
Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.
Metropolitan Area Networks: IEEE 802.6, SMDS
Switching: Circuit Switching, Packet Switching, Message Switching.
Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:
Multiple Access Techniques: Frequency- Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA), OFDM and OFDMA. Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization.
TEXT BOOKS:

REFERENCE BOOKS:
1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.

Course outcomes:
At the end of this course the student can able to:
1. Model digital communication system using appropriate mathematical techniques (error
   probability, constellation diagrams, pharos diagrams).
2. Understanding the basic concepts of how digital data is transferred across computer
   networks.
3. Independently understand basic computer network technology.
4. Understand and explain Data Communications System and its components.
5. Identify the different types of network topologies and protocols.
6. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
7. Identify the different types of network devices and their functions within a network
8. Understand and building the skills of sub netting and routing mechanisms.
9. Familiarity with the basic protocols of computer networks, and how they can be used
10. To assist in network design and implementation.
I Year I Semester

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRANSFORM TECHNIQUES</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

(ELECTIVE – I)

UNIT -I:
Fourier Analysis:

UNIT -II:
Transforms:
Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT, Singular value Decomposition – definition, properties and applications

UNIT -III:
Continuous Wavelet Transform (CWT):
Short comings of STFT, Need for wavelets, Wavelet Basis- Concept of Scale and its relation with frequency, Continuous time wavelet Transform Equation- Series Expansion using Wavelets- CWT-Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies.

UNIT -IV:
Multi Rate Analysis and DWT:
Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -V:
Wavelet Packets and Lifting: Wavelet Packet Transform, Wavelet packet algorithms, Thresholding-Hard thresholding, Soft thresholding, Multidimensional Wavelets, Bi-orthogonal basis- B-Splines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS:
REFERENCE BOOKS:


Course Outcomes: On completion of this course student will be able to:
1. The student will learn basics of two-dimensional transforms.
2. Understand the definition, properties and applications of various two-dimensional transform.
3. Understand the basic concepts of wavelet transform.
4. Understand the special topics such as wavelet packets, Bi-orthogonal wavelets e.t.c.
UNIT-I:
VLSI Technology: Fundamentals and applications, IC production process, semiconductor processes, design rules and process parameters, layout techniques and process parameters.
VLSI Design: Electronic design automation concept, ASIC and FPGA design flows, SOC designs, design technologies: combinational design techniques, sequential design techniques, state machine logic design techniques and design issues.

UNIT-II:
CMOS VLSI Design: MOSTechnology and fabrication process of pMOS, nMOS, CMOS and BiCMOS technologies, comparison of different processes.
Building Blocks of a VLSI circuit: Computer architecture, memory architectures, communication interfaces, mixed signal interfaces.
VLSI Design Issues: Design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design.

UNIT-III:
Basic electrical properties of MOS and BiCMOS circuits, MOS and BiCMOS circuit design processes, Basic circuit concepts, scaling of MOS circuits-qualitative and quantitative analysis with proper illustrations and necessary derivations of expressions.

UNIT-IV:
Subsystem Design and Layout: Some architectural issues, switch logic, gate logic, examples of structured design (combinational logic), some clocked sequential circuits, other system considerations.
Subsystem Design Processes: Some general considerations and an illustration of design processes, design of an ALU subsystem.

UNIT-V:
Floor Planning: Introduction, Floor planning methods, off-chip connections.
Architecture Design: Introduction, Register-Transfer design, high-level synthesis, architectures for low power, architecture testing.
Chip Design: Introduction and design methodologies.

TEXT BOOKS:
REFERENCE BOOKS:


Course Outcomes

1. Review of FET fundamentals for VLSI design.
2. To acquires knowledge about stick diagrams and layouts.
3. Enable to design the subsystems based on VLSI concepts.
Core Objectives:
The main objectives of this subject are:
1. Derivation of Radar range and Design of matched filter for different noises.
2. Signal detection techniques at receiver.
4. The characteristics of a Linear pulse and digital compression to Radar signals.
5. The principles of different phase coding techniques and analysis.

UNIT -I:
Introduction:

UNIT -II:
Detection of Radar Signals in Noise:

UNIT -III:
Waveform Selection [3, 2]:

UNIT -IV:
Pulse Compression in Radar Signals:
UNIT V:
Phase Coding Techniques:
Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar.
Poly Phase Codes: Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Sidelobe Reduction for Phase Coded PC Signals.

TEXT BOOKS:

REFERENCE BOOKS:

Core Outcomes:
At the end of this course the student can able to:

1. Understand the operation of Radar and characteristics of Matched filter for non-white noise.
2. Understand the various detection criterion and types of detectors that can be used to detect the Radar signals in noise.
3. Understand the waveform design requirements and optimum waveforms for the detection of signals in clutter.
4. Know the significance and types of pulse compression techniques for analog and digital signals.
5. Understand the requirements of phase coding in Radar and various poly phase codes used for phase coding.
STATISTICAL SIGNAL PROCESSING
(ELECTIVE - II)

UNIT I
**Signal models and characterization:** Types and properties of statistical models for signals and how they relate to signal processing. Common second-order methods of characterizing signals including autocorrelation, partial correlation, cross-correlation, power spectral density and cross-power spectral density.

UNIT II
**Spectral estimation:** Nonparametric methods for estimation of power spectral density, autocorrelation, cross-correlation, transfer functions, and coherence from finite signal samples.

UNIT III
**Review of signal processing:** A review on random processes, a review on filtering random processes, Examples.

**Statistical parameter estimation:** Maximum likelihood estimation, maximum a posterior estimation, Cramer-Rao bound.

UNIT IV
**Eigen structure based frequency estimation:** Pisarenko, MUSIC, ESPRIT their application in sensor array direction finding.

**Spectrum estimation:** Moving average (MA), Auto Regressive (AR), Auto Regressive Moving Average (ARMA), Various non-parametric approaches.

UNIT V
**Wiener filtering:** The finite impulse case, causal and non-causal infinite impulse responses cases. Least mean squares adaptation, recursive least squares adaptation, Kalman filtering.

TEXT BOOKS:

REFERENCE BOOKS:

Course Outcomes:
1. Analyse signals and develop their statistical models for efficient processing
2. Formulate filtering problems from real life applications and design filtering solutions to estimate a desired signal from a given mixture by minimizing a cost function
3. Design and analyse efficient algorithms for estimation of various parameters of signals with different constraints
4. Develop efficient methods for spectrum and frequency estimation suiting the requirements derived from practical problems
**OPTICAL COMMUNICATION TECHNOLOGY**  
*(ELECTIVE -II)*

**Course Objectives**
1. To expose the students to the basics of signal propagation through optical fibers, fiber impairments.
2. Students should be familiar with commonly used components and subsystems in optical communication and network systems.
3. To know the Optical Modulation and demodulation and Error Detection and Correction codes.
4. Learn about optical amplifier Transmission system model, power penalty-transmitter, power penalty-transmitter, receiver Scope – receiver optical amplifiers, crosstalk, dispersion.
5. Learn about necessity of wavelength division multiplexing (WDM), working principle and techniques of multiplexing, and Overall System Design considerations and optical networks.

**UNIT –I:**  
**Signal propagation in Optical Fibers:**

**UNIT –II:**  
**Fiber Optic Components for Communication & Networking:**
Couplers, Isolators and Circulators, Multiplexers, Bragg GRATings, Fabry-Perot Filters, Mach Zender Interferometers, Arrayed Waveguide Grating, Tunable Filters, High Channel Count Multiplexer Architectures, Optical Amplifiers, Direct and External Modulation Transmitters, Pump Sources for Amplifiers, Optical Switches and Wavelength Converters.

**UNIT –III:**  
**Modulation and Demodulation:**

**UNIT -IV:**  
**Transmission System Engineering:**
System Model, Power Penalty in Transmitter and Receiver, Optical Amplifiers, Crosstalk and Reduction of Crosstalk, Cascaded Filters, Dispersion Limitations and Compensation Techniques.

**UNIT –V:**  
**Fiber Non-linearities and System Design Considerations:**
Limitation in High Speed and WDM Systems due to Non-linearities in Fibers, Wavelength Stabilization against Temperature Variations, Overall System Design considerations – Fiber Dispersion, Modulation, Non-Linear Effects, Wavelengths, All Optical Networks.
TEXT BOOKS:

REFERENCE BOOKS:

Course outcomes
At the end of this course the student can able to:

1. Able to analyze characteristics of optical fiber and signal propagation through optical fibers
2. Know the commonly used components and subsystems in optical communication and network systems ,Working principle of optical communication components ,amplifiers, filters
3. Able to analyze Transmission system model
4. Understand the importance of wavelength division multiplexing (WDM) and de-multiplexing,
UNIT -I:
Introduction:

Modern Techniques:
Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

UNIT -II:
Encryption Algorithms:

UNIT -III:

UNIT -IV:

UNIT –V:
IP Security:

Intruders, Viruses and Worms
Intruders, Viruses and Related threats.
Fire Walls: Fire wall Design Principles, Trusted systems.
TEXT BOOKS:

REFERENCE BOOKS:
1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
5. Introduction to Cryptography, Buchmann, Springer.

Course Outcomes:
At the end of the course, students will be able to:
1. Identify and utilize different forms of cryptography techniques.
2. Incorporate authentication and security in the network applications.
3. Distinguish among different types of threats to the system and handle the same.
I Year I Semester

0 0 4 2

SYSTEM DESIGN USING VERILOG HDL LABORATORY

List of Experiments:

1) Verilog implementation of 8:1 Mux/Demux, Full Adder, 8-bit Magnitude comparator, Encoder/decoder, Priority encoder, D-FF, 4-bit Shift registers (SISO, SIPO, PISO, bidirectional), 3-bit Synchronous Counters, Binary to Gray converter, Parity generator.
2) Sequence generator/detectors, Synchronous FSM – Mealy and Moore machines.
3) Vending machines - Traffic Light controller, ATM, elevator control.
4) PCI Bus & arbiter and downloading on FPGA.
5) UART/ USART implementation in Verilog.
6) Realization of single port SRAM in Verilog.
7) Verilog implementation of Arithmetic circuits like serial adder/ subtractor, parallel adder/subtractor, serial/parallel multiplier.
8) Discrete Fourier transform/Fast Fourier Transform algorithm in Verilog.

Course Outcomes:

At the end of the laboratory work, students will be able to:

1. Identify, formulate, solve and implement problems in signal processing, communication systems etc using RTL design tools.
2. Use EDA tools like Cadence, Mentor Graphics and Xilinx.
I Year I Semester

L   T   P   C
0   0   4   2

DATA COMMUNICATIONS LAB

List of Experiments:

1. Study of serial interface RS – 232
2. Study of pc to pc communication using parallel port
3. To establish pc-pc communication using LAN
4. Study of LAN using star topology, bus topology and tree topology
5. Study and configure modem of a computer
6. To configure a hub/switch
7. To study the interconnections of cables for data communication
8. Study of a wireless communication system
9. Set up of time division multiplexing using fiber optics
10. Digital Fiber Optical Transmitter and Receiver
RESEARCH METHODOLOGY AND IPR

Unit 1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2: Effective literature studies approaches, analysis Plagiarism , Research ethics,

Unit 3: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee


References:

2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

Course Outcomes:
At the end of this course, students will be able to
1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.
I Year II Semester

L  T  P  C
3  0  0  3

IMAGE AND VIDEO PROCESSING

Course objectives:
• The basic concepts and methods to develop foundation in digital image processing and video processing are introduced and The Importance of various image transforms, image transform properties are discussed.
• Understanding the image enhancement techniques in both spatial domain and frequency domain.
• The process of recovering image that has been degraded by noise or any other degradation phenomenon.
• Understanding the importance of image segmentation and various methods used for segmentation, The importance of reducing the data for digital image representation by using various image compression techniques.
• To understand the importance of video processing in multimedia and the various video formation models, motion estimation techniques in video processing.
• Applications of motion estimation in video processing

UNIT –I:
Fundamentals of Image Processing and Image Transforms:
Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing.
Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.

UNIT –II:
Image Enhancement:
Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.
Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.
Image Restoration:
Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution.

UNIT –III:
Image Segmentation:
Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour
Image Compression:
UNIT –IV:
Basic Steps of Video Processing:

UNIT –V:
2-D Motion Estimation:
Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

REFERENCE BOOKS:

Course Outcomes
1. Know digital image, representation of digital image, importance of image resolution, applications in image processing, the advantages of representation of digital images in transform domain, application of various image transforms.
2. Understand and analyze the image enhancement and image degradation, image restoration techniques using spatial filters and frequency domain.
3. Understand and analyze the detection of point, line and edges in images, edge linking and various segmentation techniques and the redundancy in images, various image compression techniques.
4. Describe the video technology from analog color TV systems to digital video systems, how video signal is sampled and filtering operations in video processing.
5. Describe the general methodologies for 2D motion estimation, various coding used in video processing.
WIRELESS COMMUNICATIONS AND NETWORKS

OBJECTIVES:
1. The Aim of this course is to introduce the fundamental technologies for wireless communications and networking.
2. It introduces the Key concepts of Cellular and Mobile communications.
3. Introducing the concepts of Multiple Access Schemes.
4. Introducing the important concepts of Wireless networking, WLAN, WLL, IEEE 802 standards.

UNIT -I:
The Cellular Concept-System Design Fundamentals:
Introduction, Frequency Reuse, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Trunking and Grade of Service

UNIT –II:
Mobile Radio Propagation: Large-Scale Path Loss:

UNIT –III:
Mobile Radio Propagation: Small –Scale Fading and Multipath
Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke’s model for flat fading, spectral shape due to Doppler spread in Clarke’s model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.
UNIT -IV: 
Equalization and Diversity

UNIT -V: 
Wireless Networks
Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a, b, g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

TEXT BOOKS:

REFERENCE BOOKS:
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.

Course Outcomes: At the end of this course, students will be able to
1. Understand Cellular communication concepts
2. Study the mobile radio propagation
3. Study the wireless network different type of MAC protocols
I Year II Semester

CMOS ANALOG AND DIGITAL IC DESIGN
(ELECTIVE-III)

UNIT-I:

MOS Design: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II:
Combinational MOS Logic Circuits: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

Sequential MOS Logic Circuits: Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT-III:

Semiconductor Memories: Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.

UNIT-IV:
Analog CMOS Sub-Circuits: MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT-V:


TEXT BOOKS:
REFERENCE BOOKS:

3. CMOS: Circuit Design, Layout and Simulation- Baker, Li and Boyce, PHI.

Course Outcomes:

At the end of this course, students will be able to

1. Analyze, design, optimize and simulate analog and digital circuits using CMOS constrained by the designmetrics.
2. Connect the individual gates to form the building blocks of a system.
UNIT-I: Fundamentals of Computer Design:
Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, measuring and reporting performance, Quantitative principles of computer design, Amdahl’s law.
Instruction set principles and examples- Introduction, classifying instruction set- memory addressing-type and size of operands, Operations in the instruction set.

UNIT-II: Pipelines:
Introduction, basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties.

UNIT-III:
Instruction Level Parallelism (ILP)-The Hardware Approach: Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo’s approach, Branch prediction, High performance instruction delivery- Hardware based speculation.
ILP Software Approach: Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues - Hardware verses Software.

UNIT-IV: Multi Processors and Thread Level Parallelism:
Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – Memory architecture, Synchronization.

UNIT-V: Inter Connection and Networks:
Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.
Intel Architecture: Intel IA-64 ILP in embedded and mobile markets Fallacies and pit falls.

TEXT BOOKS:

REFERENCE BOOKS:

Course Outcomes: At the end of this course, students will be able to
1. Understand parallelism and pipelining concepts, the design aspects and challenges.
2. Evaluate the issues in vector and arrayprocessors.
3. Study and analyze the high performance scalable multithreaded and multiprocessor systems.
UNIT –I:
Introduction:
Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II:
Artificial Neural Networks:
Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III:
Fuzzy Logic System:
Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time-delay system.

UNIT –IV:
Genetic Algorithm:
Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and ant-colony search techniques for solving optimization problems.

UNIT –V:
Applications:

TEXT BOOKS:
REFERENCE BOOKS:


Course Outcomes

At the end of this course the student can able to:

1. Understand the basic concepts of Artificial neural network systems.
2. Understand the McCulloch-Pitts neuron model, simple and multilayer Perception, Adeline and Madeline concepts.
3. Data processing, Hopfield and self-organizing network.
4. Difference between crisp sets to fuzzy sets, fuzzy models, fuzzification, inference,
5. membership functions, rule based approaches and defuzzification.
6. Self – organizing fuzzy logic control, non linear time delay systems.
7. Understand the concept of Genetic Algorithm steps. Tabu, anD-colony search techniques for solving optimization problems.
8. GA applications to power system optimization problems, identification and control of linear and nonlinear dynamic systems using MATLAB-Neural network toolbox.
9. Know the application and importance stability analysis
DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES
(ELECTIVE -IV)

Course Objectives:
1) To recall the digital transform techniques (Fourier and z-domain).
2) To introduce architectural features of programmable DSP Processors of Texas Instruments (TI’s) and Analog Devices (AD’s).
3) To give practical examples of DSP Processor architectures for better understanding.
4) To develop the programming knowledge using Instruction set of DSP Processors.
5) To understand interfacing techniques to memory and I/O devices.

UNIT –I:
Introduction to Digital Signal Processing:
Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations:
Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT –II:
Architectures for Programmable DSP Devices:
Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT -III:
Programmable Digital Signal Processors:
Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.

UNIT –IV:
Analog Devices Family of DSP Devices:
Introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.
UNIT –V:  
Interfacing Memory and I/O Peripherals to Programmable DSP Devices:  
Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:  

REFERENCE BOOKS:  
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI  

Course Outcomes:  
At the end of this course, students will be able to  
1) Understand the basics concepts of Digital Signal Processing (DSP) and transforms.  
2) To distinguish between the architectural features of General purpose processors and Programmable DSP processors.  
3) Understand the architectures of TMS320C54xx devices.  
4) Understand the architectures of ADSP 2100 DSP devices and Black fin Processor.  
5) Interface various devices to DSP Processors.  
6) Able to write simple assembly language programs using instruction set of TMS320C54xx.
I Year II Semester

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

ELECTROMAGNETIC INTERFERENCE AND ELECTROMAGNETIC COMPATIBILITY (EMI / EMC) (ELECTIVE-IV)

Course objectives:

1. To introduce enough knowledge regarding the Electromagnetic interference/ Electromagnetic compatibility, Its practical experiences and concerns, and various sources both the natural and Nuclear sources of EMI.

2. To know the practical experiences due to EMI such as mains power supply, switches and relaysetc and Analyze EM Propagation and Crosstalk

3. To know various methods of the measurements radiated and conducted interference in open area test sites and in chambers.

4. To Learn about the various methods of minimizing the EMI.

5. To know the National/International EMC Standards.

UNIT -I:
Introduction, Natural and Nuclear Sources of EMI / EMC: Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations, An overview of EMI / EMC, Natural and Nuclear sources of EMI.

UNIT -II:
EMI from Apparatus, Circuits and Open Area Test Sites: Electromagnetic emissions, Noise from relays and switches, Non-linearities in circuits, passive intermodulation, Cross talk in transmission lines, Transients in power supply lines, Electromagnetic interference (EMI), Open area test sites and measurements.

UNIT -III:
Radiated and Conducted Interference Measurements and ESD: Anechoic chamber, TEM cell, GH TEM Cell, Characterization of conduction currents / voltages, Conducted EM noise on power lines, Conducted EMI from equipment, Immunity to conducted EMI detectors and measurements, ESD, Electrical fast transients / bursts, Electrical surges.

UNIT -IV:
Grounding, Shielding, Bonding and EMI filters: Principles and types of grounding, Shielding and bonding, Characterization of filters, Power lines filter design.

UNIT -V:
Cables, Connectors, Components and EMC Standards:
EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, optoisolators, National / International EMC standards.

TEXT BOOKS:


2. Electromagnetic Interference and Compatibility IMPACTseries, IIT – Delhi, Modules 1-9
REFERENCE BOOKS:

Course outcomes
At the end of this course the student can able to:
1. Understand the electromagnetic environment the definitions of EMI and EMC, history of EMI some examples of practical experiences due to EMI such as mains power supply, switches and relays etc.
2. Understand the celestial electromagnetic noise the occurrence of lightning discharge and their effects, the charge accumulation and discharge in an electrostatic discharge, model ESD wave form, the various cases of nuclear explosion and the transients.
3. Understand the methods to measure RE and RS in the open area test sites
4. Understand the measurement facilities and procedures using anechoic chamber, TEM cell, reverberating chamber GTEM cell.
OBJECTIVES:
The main objectives of this course are given below:
• Its main objective is to teach the basic concepts and techniques and java program structure which form
the object oriented programming paradigm

UNIT I:
Objective: Focus on object oriented concepts and java program structure and its installation

Introduction to OOP
Introduction, Need of Object Oriented Programming, Principles of Object Oriented Languages, Procedural languages Vs OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features, Installation of JDK1.6

UNIT II:
Objective: Comprehension of java programming constructs, control structures in Java

Programming Constructs
Variables, Primitive Datatypes, Identifiers- Naming Conventions, Keywords, Literals, Operators- Binary, Unary and ternary, Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of control-Branching, Conditional, loops..
Classes and Objects- classes, Objects, Creating Objects, Methods, constructors-Constructor overloading, Garbage collector, Class variable and Methods-Static keyword, this keyword, Arrays, Command line arguments

UNIT III:
Objective: Implementing Object oriented constructs such as various class hierarchies, interfaces and exception handling

Inheritance: Types of Inheritance, Deriving classes using extends keyword, Method overloading, super keyword, final keyword, Abstract class
Interfaces, Packages and Enumeration: Interface-Extending interface, Interface Vs Abstract classes, Packages-Creating packages, using Packages, Access protection, java.lang package
Exceptions & Assertions - Introduction, Exception handling techniques-try...catch, throw, throws, finally block, user defined exception, Assertions

UNIT IV:
Objective: Understanding of Thread concepts and I/O in Java
MultiThreading :java.lang.Thread, The main Thread, Creation of new threads, Thread priority, Multithreading, Syncronization, suspending and Resuming threads, Communication between Threads
Input/Output: reading and writing data, java.io package

UNIT V:
Objective: Being able to build dynamic user interfaces using applets and  Event handling in java
Applets- Applet class, Applet structure, An Example Applet Program, Applet Life Cycle, paint(),update() and repaint()
Event Handling -Introduction, Event Delegation Model, java.awt.event Description, Event Listeners, Adapter classes, Inner classes
Understanding of various components of Java AWT and Swing and writing code snippets using them

Abstract Window Toolkit
Why AWT?, java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar

Swing: Introduction, JFrame, JApplet, JPanel, Components in swings, Layout Managers, JList and JScrollPane, Split Pane, JTabbedPane, Dialog Box

Text Books:
1. The Complete Reference Java, 8ed, Herbert Schildt, TMH
3. JAVA for Beginners, 4e, Joyce Farrell, Ankit R. Bhavsar, Cengage Learning.
4. Object oriented programming with JAVA, Essentials and Applications, Raj Kumar Bhuyya, Selvi, Chu TMH
5. Introduction to Java rogramming, 7th ed, Y Daniel Liang, Pearson

Reference Books:
1. JAVA Programming, K.Rajkumar.Pearson
2. Core JAVA, Black Book, NageswaraRao, Wiley, Dream Tech
3. Core JAVA for Beginners, RashmiKanta Das, Vikas.

OUTCOMES:
At the end of this course the student can able to:
1. The model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism
2. Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections
3. How to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.
4. How to test, document and prepare a professional looking package for each business project using java doc.
ADVANCED COMMUNICATIONS LAB

Note:

A. Minimum of 10 Experiments have to be conducted
B. All Experiments may be Simulated using MATLAB and to be verified using related training kits.
   1. Measurement of Bit Error Rate using Binary Data
   2. Verification of minimum distance in Hamming code
   3. Determination of output of Convolutional Encoder for a given sequence
   4. Determination of output of Convolutional Decoder for a given sequence
   5. Efficiency of DS Spread- Spectrum Technique
   6. Simulation of Frequency Hopping (FH) system
   7. Effect of Sampling and Quantization of Digital Image
   8. Verification of Various Transforms (FT / DCT/ Walsh / Hadamard) on a given Image (Finding Transform and Inverse Transform)
   9. Point, Line and Edge detection techniques using derivative operators.
   10. Implementation of FIR filter using DSP Trainer Kit (C-Code/ Assembly code)
   11. Implementation of IIR filter using DSP Trainer Kit (C-Code/ Assembly code)
   12. Determination of Losses in Optical Fiber
   13. Observing the Waveforms at various test points of a mobile phone using Mobile Phone Trainer
   15. Study of ISDN Training System with Protocol Analyzer

Course Outcomes:
At the end of this course, students will be able to
   1. Identify the different types of network devices and their functions within anetwork.
   2. Understand and build the skills of sub-netting and routing mechanisms.
   3. Understand basic protocols of computer networks, and how they can be used to assist in network design and implementation.
I Year II Semester

L T P C
0 0 4 2

Advanced Digital Image and Video Processing lab

List of Experiments:
1. Perform basic operations on images like addition, subtraction etc.
2. Plot the histogram of an image and perform histogram equalization
3. Implement segmentation algorithms
4. Perform video enhancement
5. Perform video segmentation
6. Perform image compression using lossy technique
7. Perform image compression using lossless technique
8. Perform image restoration
9. Convert a colour model into another
10. Calculate boundary features of an image
11. Calculate regional features of an image
12. Detect an object in an image/video using template matching/Bayes classifier

Course Outcomes:
At the end of this course, students will be able to
   1. Perform and analyze image and video enhancement and restoration
   2. Perform and analyze image and video segmentation and compression
   3. work and process viz., detection, extraction on the image/video
MINI PROJECT

Syllabus Contents
The students are required to search / gather the material / information on a specific a topic comprehend it and present / discuss in the class.

Course Outcomes
At the end of this course, students will be able to
1. Understand of contemporary / emerging technology for various processes and systems.
2. Share knowledge effectively in oral and written form and formulate documents.
DETECTION AND ESTIMATION THEORY  
(ELECTIVE IV)

UNIT –I: 
**Random Processes:** Discrete Linear Models, Markov Sequences and Processes, Point Processes, and Gaussian Processes.

UNIT –II: 
**Detection Theory:** Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)- minimum probability error with and without equal a priori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT –III: 
**Linear Minimum Mean-Square Error Filtering:** Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –IV: 
**Statistics:** Measurements, Nonparametric Estimators of Probability Distribution and Density Functions, Point Estimators of Parameters, Measures of the Quality of Estimators, Introduction to Interval Estimates, Distribution of Estimators, Tests of Hypotheses, Simple Linear Regression, Multiple Linear Regression.

UNIT –V: 
**Estimating the Parameters of Random Processes from Data:** Tests for Stationarity and Ergodicity, Model-free Estimation, Model-based Estimation of Autocorrelation Functions, Power Special Density Functions.

**TEXT BOOKS:**
REFERENCE BOOKS:

3. Introduction to Statistical Signal Processing with Applications - Srinath, Rajasekaran, Viswanathan, 2003, PHI.

Course Outcomes:

At the end of this course, students will be able to

1. Understand the mathematical background of signal detection and estimation
2. Use classical and Bayesian approaches to formulate and solve problems for signal detection and parameter estimation from noisy signals.
III Semester

ADVANCED DIGITAL SIGNAL PROCESSING
(ELECTIVE IV)

UNIT –I:
Review of DFT, FFT, IIR Filters and FIR Filters:
Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:

UNIT -III:
Non-Parametric Methods of Power Spectral Estimation: Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT –IV:
Implementation of Digital Filters: Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT –V:

TEXT BOOKS:

REFERENCE BOOKS:

Course Outcomes:
At the end of this course, students will be able to
1. To understand theory of different filters and algorithms
2. To understand theory of multirate DSP, solve numerical problems and write algorithms
3. To understand theory of prediction and solution of normalequations
4. To know applications of DSP at blocklevel
III Semester

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

CODING THEORY AND APPLICATIONS
(ELECTIVE IV)

UNIT –I:
Coding for Reliable Digital Transmission and Storage: Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.
Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT –II:
Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT –III:
Convolutional Codes: Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority-logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT –IV:

UNIT -V:
BCH – Codes: BCH code- Definition, Minimum distance and BCH Bounds, Decoding Procedure for BCH Codes- Syndrome Computation and Iterative Algorithms, Error Location Polynomials and Numbers for single and double error correction

TEXT BOOKS:
REFERENCE BOOKS:
1. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Ed, 2009, TMH.

Course Outcomes:
On completion of this course student will be able to
1. Learning the measurement of information and errors.
2. Obtain knowledge in designing Linear Block Codes and Cyclic codes.
3. Construct tree and trellises diagrams for convolution codes
4. Design the Turbo codes and Space time codes and also their applications
Syllabus Contents:
The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following:
- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain

The student should complete the following:
- Literature survey Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:
- Experimental verification / Proof of concept.
- Design, fabrication, testing of Communication System.
- The viva-voce examination will be based on the above report and work.

- As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.
- The dissertation may be carried out preferably in-house i.e. department’s laboratories and centers OR in industry allotted through department’s T & P coordinator.
- After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include IEEE/IET/IETE/ Springer/Science Direct/ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.
- Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.
- Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.
- Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend repeating the Phase-I work.
During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.

- Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, a record of continuous progress.
- Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work.

**Course Outcomes:**
At the end of this course, students will be able to

1. Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
2. Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
3. Ability to present the findings of their technical solution in a written report.
4. Presenting the work in International/ National conference or reputed journals.
OPEN ELECTIVES
BUSINESS ANALYTICS

Unit 1:
Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

Unit 2:

Unit 3:
Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit 4:
Monte Carlo Simulation and Risk Analysis: Monte CarleSimulation

Unit 5:

Unit 6:
Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism

Reference:
2. Business Analytics by James Evans, personsEducation.

COURSE OUTCOMES
1. Students will demonstrate knowledge of data analytics.
2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
4. Students will demonstrate the ability to translate data into clear, actionable insights.
III Semester

 OPENELECTIVES
 INDUSTRIAL SAFETY

Unit-1:
Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc. Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit-2:
Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-3:

Unit-4:
Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic,automotive, thermal and electrical equipment’s like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine,v. Boiler,vi .Electrical motors, Types of faults in machine tools and their generalcauses.

Unit-5:
Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Reference:
Unit 1:
Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Unit 2
Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

Unit 3:
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

Unit 4
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit 5
Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:

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

1. Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
2. Students should able to apply the concept of non-linear programming
3. Students should able to carry out sensitivity analysis
4. Student should able to model the real world problem and simulate it.
OPEN ELECTIVE
COST MANAGEMENT OF ENGINEERING PROJECTS

Introduction and Overview of the Strategic Cost Management Process

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non-technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process


References:
1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.
III Semester

OPEN ELECTIVE
COMPOSITE MATERIALS

UNIT–I:

UNIT – II:

UNIT – III:

UNIT–IV:

UNIT – V:
Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

References:
OPEN ELECTIVE
WASTE TO ENERGY

Unit-I:
Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit-II:

Unit-III:

Unit-IV:
Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V:
Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

References:
IV Semester

L T P C
0 0 32 16

(DISSERTATION) DISSERTATION PHASE – I AND PHASE – II

Syllabus Contents:
The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain

The student should complete the following:

- Literature survey
- Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- Experimental verification / Proof of concept.
- Design, fabrication, testing of Communication System.
- The viva-voce examination will be based on the above report and work.


- As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.
- The dissertation may be carried out preferably in-house i.e. department’s laboratories and centers OR in industry allotted through department’s T & P coordinator.
- After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include IEEE/ IET/ IETE/ Springer/ Science Direct/ ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.
- Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.
- Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.
- Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend repeating the Phase-I work.
During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.

- Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, a record of continuous progress.
- Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work

**Course Outcomes:**

At the end of this course, students will be able to

5. Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
6. Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
7. Ability to present the findings of their technical solution in a written report.
8. Presenting the work in International/ National conference or reputed journals.
Course objectives:
Students will be able to:
Understand that how to improve your writing skills and level of readability
Learn about what to write in each section
Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Syllabus

<table>
<thead>
<tr>
<th>Units</th>
<th>CONTENTS</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Planning and Preparation, Word Order, Breaking up long sentences,</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Structuring Paragraphs and Sentences, Being Concise and Removing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Redundancy, Avoiding Ambiguity and Vagueness</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Clarifying Who Did What, Highlighting Your Findings, Hedging and</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Introduction</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Review of the Literature, Methods, Results, Discussion, Conclusions,</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>The Final Check</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>key skills are needed when writing a Title, key skills are needed when</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>writing an Abstract, key skills are needed when writing an Introduction,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>skills needed when writing a Review of the Literature,</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>skills are needed when writing the Methods, skills needed when writing</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>the Results, skills are needed when writing the Discussion, skills are</td>
<td></td>
</tr>
<tr>
<td></td>
<td>needed when writing the Conclusions</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>useful phrases, how to ensure paper is as good as it could possibly</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>be the first-time submission</td>
<td></td>
</tr>
</tbody>
</table>

Suggested Studies:
AUDIT 1 and 2: DISASTER MANAGEMENT

Course Objectives: - Students will be able to:

1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Syllabus

<table>
<thead>
<tr>
<th>Units</th>
<th>CONTENTS</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction&lt;br&gt;Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Disaster Prone Areas In India&lt;br&gt;Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Disaster Preparedness And Management&lt;br&gt;Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Risk Assessment&lt;br&gt;Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People’s Participation In Risk Assessment. Strategies for Survival.</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Disaster Mitigation&lt;br&gt;Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.</td>
<td>4</td>
</tr>
</tbody>
</table>
Suggested Readings:
2. Sahni, PardeepEt.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.
AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Objectives
1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Syllabus

<table>
<thead>
<tr>
<th>Unit</th>
<th>Content</th>
<th>Hours</th>
</tr>
</thead>
</table>
| 1    | • Alphabets in Sanskrit,  
      • Past/Present/Future Tense,  
      • Simple Sentences | 8 |
| 2    | • Order  
      • Introduction of roots  
      • Technical information about Sanskrit Literature | 8 |
| 3    | • Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics | 8 |

Suggested reading
1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

Course Output
Students will be able to
1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students
AUDIT 1 and 2: VALUE EDUCATION

Course Objectives
Students will be able to
1. Understand value of education and self-development
2. Imbibe good values in students
3. Let the should know about the importance of character

Syllabus

<table>
<thead>
<tr>
<th>Unit</th>
<th>Content</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>• Values and self-development – Social values and individual attitudes. Work ethics, Indian vision of humanism. • Moral and non-moral valuation. Standards and principles. • Value judgements</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>• Importance of cultivation of values. • Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. • Honesty, Humanity. Power of faith, National Unity. • Patriotism. Love for nature, Discipline</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>• Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. • Punctuality, Love and Kindness. • Avoid fault Thinking. • Free from anger, Dignity of labour. • Universal brotherhood and religious tolerance. • True friendship. • Happiness Vs suffering, love for truth. • Aware of self-destructive habits. • Association and Cooperation. • Doing best for saving nature</td>
<td>6</td>
</tr>
</tbody>
</table>
4

- Character and Competence – Holy books vs Blind faith.
- Self-management and Good health.
- Science of reincarnation.
- Equality, Nonviolence, Humility, Role of Women.
- All religions and same message.
- Mind your Mind, Self-control.
- Honesty, Studying effectively

Suggested reading
1 Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

Course outcomes
Students will be able to
1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality

AUDIT 1 and 2: CONSTITUTION OF INDIA

Course Objectives:
Students will be able to:
1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Syllabus

<table>
<thead>
<tr>
<th>Units</th>
<th>Content</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>History of Making of the Indian Constitution: History Drafting Committee, (Composition &amp; Working)</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Philosophy of the Indian Constitution: Preamble Salient Features</td>
<td>4</td>
</tr>
</tbody>
</table>
### Contours of Constitutional Rights & Duties:
- Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

### Organs of Governance:
- Parliament
- Composition
- Qualifications and Disqualifications
- Powers and Functions
  - Executive
    - President
    - Governor
    - Council of Ministers
  - Judiciary, Appointment and Transfer of Judges, Qualifications
  - Powers and Functions

### Local Administration:
- District’s Administration head: Role and Importance,
- Elected officials and their roles, CEO ZilaPachayat: Position and role.
- Block level: Organizational Hierarchy (Different departments),
- Village level: Role of Elected and Appointed officials,
- Importance of grass root democracy

### Election Commission:
- Election Commission: Role and Functioning.
- Chief Election Commissioner and Election Commissioners.
- State Election Commission: Role and Functioning.
- Institute and Bodies for the welfare of SC/ST/OBC and women.

### Suggested reading
1. The Constitution of India, 1950 (Bare Act), Government Publication.
Course Outcomes:

Students will be able to:
1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

AUDIT 1 and 2: PEDAGOGY STUDIES

Course Objectives:
Students will be able to:
4. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
5. Identify critical evidence gaps to guide the development.

Syllabus

<table>
<thead>
<tr>
<th>Units</th>
<th>Content</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>☐ Introduction and Methodology: ☐ Aims and rationale, Policy background, Conceptual framework and terminology ☐ Theories of learning, Curriculum, Teacher education. ☐ Conceptual framework, Research questions. ☐ Overview of methodology and Searching.</td>
<td>4</td>
</tr>
</tbody>
</table>
Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.

Curriculum, Teacher education.

Evidence on the effectiveness of pedagogical practices
Methodology for the in depth stage: quality assessment of included studies.
How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
Theory of change.
Strength and nature of the body of evidence for effective pedagogical practices.
Pedagogic theory and pedagogical approaches.
Teachers’ attitudes and beliefs and Pedagogic strategies.

Professional development: alignment with classroom practices and follow-up support
Peer support
Support from the head teacher and the community.
Curriculum and assessment
Barriers to learning: limited resources and large class sizes

Research gaps and future directions
Research design
Contexts
Pedagogy
Teacher education
Curriculum and assessment
Dissemination and research impact.

Suggested reading

Course Outcomes:
Students will be able to understand:
1. What pedagogical practices are being used by teachers in formal and informal classrooms
in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

Course Objectives
1. To achieve overall health of body and mind
2. To overcome stress

Syllabus

<table>
<thead>
<tr>
<th>Unit</th>
<th>Content</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>• Definitions of Eight parts of yog. ( Ashtanga )</td>
<td>8</td>
</tr>
</tbody>
</table>
|   | Yam and Niyam. Do’s and Don’t’s in life.  
|   | i) Ahinsa, satya, astheya, bramhacharya and aparigraha  
<table>
<thead>
<tr>
<th></th>
<th>ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan</th>
<th>8</th>
</tr>
</thead>
</table>
| 3 | Asan and Pranayam  
|   | 1. Various yog poses and their benefits for mind & body  
|   | 2. Regularization of breathing techniques and its effects-Types of pranayam | 8 |

**Suggested reading**
1. ‘Yogic Asanas for Group Tarining-Part-I” : Janardan Swami YogabhysiMandal, Nagpur  
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

**Course Outcomes:**
Students will be able to:
1. Develop healthy mind in a healthy body thus improving social health also  
2. Improve efficiency

---

**AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS**

**Course Objectives**
1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

### Syllabus

<table>
<thead>
<tr>
<th>Unit</th>
<th>Content</th>
<th>Hours</th>
</tr>
</thead>
</table>
| 1    | Neetisatakam-Holistic development of personality  
      • Verses- 19,20,21,22 (wisdom)  
      • Verses- 29,31,32 (pride & heroism)  
      • Verses- 26,28,63,65 (virtue)  
      • Verses- 52,53,59 (dont’s)  
      • Verses- 71,73,75,78 (do’s) | 8 |
| 2    | Approach to day to day work and duties.  
      • Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,  
      • Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,  
      • Chapter 18-Verses 45, 46, 48. | 8 |
| 3    | Statements of basic knowledge.  
      • Shrimad Bhagwad Geeta: Chapter 2-Verses 56, 62, 68  
      • Chapter 12-Verses 13, 14, 15, 16,17, 18  
      • Personality of Role model. Shrimad Bhagwad Geeta: Chapter 2-Verses 17, Chapter 3-Verses 36,37,42,  
      • Chapter 4-Verses 18, 38,39  
      • Chapter18 – Verses 37,38,63 | 8 |

### Suggested reading
1. “Srimad Bhagavat Gita” by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

### Course Outcomes
Students will be able to
1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students