ANNA UNIVERSITY, CHENNAI
NON - AUTONOMOUS COLLEGES AFFILIATED ANNA UNIVERSITY
M.E. ELECTRONICS AND COMMUNICATION ENGINEERING
REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

I To enable graduates to possess skills to develop new innovation in the field of Electronics and Communication Engineering using analytical reasoning and state-of-the-art approaches derived from the Engineering Sciences and Engineering practice.

II To enable graduates to create useful systems, components, or processes through agile, skillful, and innovative analysis and design, while respecting economic, environmental, cultural, and ethical standards or constraints.

III To enable graduates to engage in lifelong learning, adapt to evolving Technology, work in multidisciplinary research for designing innovative products & solutions and become Entrepreneurs.

IV To enable graduates to acquire technical and managerial leadership positions in their chosen fields.

2. PROGRAM OUTCOMES (POs)

1. An ability to independently carry out research/investigation and development work to solve practical problems

2. An ability to write and present a substantial technical report/document

Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

3. An ability to apply knowledge of Electronics and communication system concepts to solve engineering problems.

4. An ability to identify and apply appropriate techniques, resources and EDA tools to model, analyze and test Electronic and communication systems

An ability to engage in life-long learning for the design and development of Electronic and communication systems taking into consideration sustainability, societal, ethical and environmental aspects.
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NON-AUTONOMOUS COLLEGES AFFILIATED ANNA UNIVERSITY
M.E. ELECTRONICS AND COMMUNICATION ENGINEERING
REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULA AND SYLLABI

SEMMESTER I

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## PROFESSIONAL ELECTIVES

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<td>FPGA Based System Design Laboratory</td>
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# Research Methodology and IPR Courses (RMC)

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# Employability Enhancement Courses (EEC)

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## Summary

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<th>Sl. No</th>
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<th>Credits Per Semester</th>
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<td>I: 21 II: 23 III: 19 IV: 12</td>
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</table>
COURSE OBJECTIVES:
The objective of this course is to enable the student to
- Grasp the basic concepts of Probability, Random variables, correlation and regression.
- Characterize the phenomena which evolve with respect to time in a probabilistic manner.
- Encourage students to develop a working knowledge of the ventral ideas of linear algebra.
- Acquire skills in analyzing Queueing Models.
- Develop a fundamental understanding of linear programming models and apply the simplex method for solving linear programming problems.

UNIT – I  LINEAR ALGEBRA  12

UNIT – II  PROBABILITY AND RANDOM VARIABLES  12

UNIT – III  RANDOM PROCESSES  12

UNIT – IV  QUEUEING THEORY  12

UNIT – V  LINEAR PROGRAMMING  12

COURSE OUTCOMES:
After the completion of the course, the student will be able to
- apply various methods in Linear Algebra to solve the system of linear equations.
- use two-dimensional random variables, correlations and regression in solving application problem.
- apply the ideas of Random Processes.
- understand the basic characteristic features of a queueing system and acquire skills in analyzing queueing models.
- apply the Simplex method for solving linear programming problems.
REFERENCES:

RM4151 RESEARCH METHODOLOGY AND IPR L T P C
2 0 0 2

UNIT I RESEARCH DESIGN 6
Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES 6
Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods.
Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING 6
Overview of Multivariate analysis, Hypotheses testing and Measures of Association.
Presenting Insights and findings using written reports and oral presentation.

UNIT IV INTELLECTUAL PROPERTY RIGHTS 6

UNIT V PATENTS 6

TOTAL: 30 PERIODS

REFERENCES:

AP4151 ADVANCED DIGITAL SIGNAL PROCESSING       L T P C
                                                   3 0 0 3

COURSE OBJECTIVES:
- To describe fundamental concepts of DSP and Discrete Transforms
- To design digital filters design
- To estimate power spectrum using non-parametric and parametric methods
- To analyze the Multirate Signal processing by decimation and interpolation.
- To apply the concept of multirate signal processing for various applications

UNIT I  DIGITAL SIGNAL PROCESSING
Sampling of analog signals - Selection of sampling frequency - Frequency response - Transfer functions - Filter structures - Fast Fourier Transform (FFT) Algorithms - Image coding - DCT.

UNIT II  DIGITAL FILTER DESIGN

UNIT III  ESTIMATION OF POWER SPECTRUM

UNIT IV  MULTI RATE SIGNAL PROCESSING
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 and Implementation for sampling rate conversion. Up-sampling using All Pass Filter.

UNIT V  APPLICATIONS OF MULTI RATE SIGNAL PROCESSING AND DSP INTEGRATED CIRCUITS

COURSE OUTCOMES:
Upon completion of the course, the students will be able to

CO1: Describe the basics of Digital Signal Processing and Discrete Time Transforms.
CO2. Design and implement FIR/IIR digital filters using various structures

TOTAL: 45 PERIODS
CO3. Estimate power spectrum using appropriate parametric/non-parametric method.
CO4: Analyze discrete time system at different sampling frequencies using the concept of Multirate signal processing
CO5: Design discrete time system for the given application using Multi rate signal processing

REFERENCES:

VE4152 EMBEDDED SYSTEM DESIGN L T P C 3 0 0 3

COURSE OBJECTIVES:
- To understand the design challenges in embedded systems.
- To program the Application Specific Instruction Set Processors.
- To understand the bus structures and protocols.
- To model processes using a state – machine model.
- To design a real time embedded system.

UNIT I EMBEDDED SYSTEM OVERVIEW 9
Embedded System Overview, Design Challenges – Optimizing Design Metrics, Design Methodology, RT-Level Combinational and Sequential Components, Optimizing Custom Components, Optimising Custom Single-Purpose Processors.

UNIT II GENERAL AND SINGLE PURPOSE PROCESSOR 9

UNIT III BUS STRUCTURES 9

UNIT IV STATE MACHINE AND CONCURRENT PROCESS MODELS 9
UNIT V  
SYSTEM DESIGN  
9
Burglar alarm system-Design goals -Development strategy-Software development-Relevance to more complex designs- Need for emulation -Digital echo unit-Creating echo and reverb-Design requirements-Designing the codecs -The overall system design

SUGGESTED ACTIVITIES:
1: Do microcontroller based design experiments.
2: Create program –state models for different embedded applications.
3: Design and develop embedded solutions for real world problems.

COURSE OUTCOMES:
CO1: Knowledge of different protocols
CO2: Apply state machine techniques and design process models.
CO3: Apply knowledge of embedded software development tools and RTOS
CO4: Apply networking principles in embedded devices.
CO5: Design suitable embedded systems for real world applications.

TOTAL:45 PERIODS

REFERENCES:

EL4101  
RF CIRCUIT DESIGN  
L T P C
3 0 0 3

COURSE OBJECTIVES:
- To understand and analyze the behaviour of high frequency components and transmission lines
- To recognize, analyze and design, the network parameters and RF filters
- To familiarize with the design of matching networks, couplers and power dividers
- To understand construction of high frequency RF active devices and design RF amplifiers
- To understand and analyze mixers and oscillators

UNIT I  
PASSIVE RF COMPONENTS AND TRANSMISSION LINE ANALYSIS  
9
Resistors, Capacitor and Inductors at High frequency – Transmission Line Analysis: Line equation, Micro strip line, Voltage Reflection Coefficient, propagation constant phase velocity and special termination - Smith Chart-Impedance transformation - Analysis of parallel RL circuit and parallel RC circuit.

UNIT II  
NETWORK THEORY AND RF FILTER DESIGN  
9
Definition - properties - interconnection of networks - ABCD parameters and S parameters - RF Filter Resonator and filter configuration - Butterworth and Chebyshev filters. Design of micro strip filters
UNIT III  IMPEDANCE MATCHING NETWORK AND PASSIVE DEVICES

UNIT IV  RF ACTIVE DEVICES AND AMPLIFIER DESIGN

UNIT V  RF OSCILLATORS AND MIXERS

SUGGESTED ACTIVITIES:
1. Design and Develop planar transmission line
2. Design and implement Filter for various RF inductor and capacitor frequencies
3. Design and implement impedance matching networks and couplers
4. Design RF amplifier with and without impedance matching networks in a Transceiver
5. Design mixer and oscillators for various RF frequencies

COURSE OUTCOMES:
Upon completion of the course, the students will be
CO1: Able to develop novel/compact transmission lines
CO2: Competent to design filters
CO3: Proficient in developing matching networks and couplers
CO4: Capable of designing Maximum gain, Low noise amplifiers
CO5: Able to develop mixers and oscillator for RF receivers

TOTAL :45 PERIODS

REFERENCES:
1. Reinhold Ludwig and Pavel Bretcho, "RF Circuit Design: Theory and Applications", Pearson Education
COURSE OBJECTIVES:

- To understand the coherent and non coherent receivers and their performance under AWGN channel conditions
- To understand the effect of signalling through bandlimited channels and Equalization techniques used to overcome ISI
- To understand different channel models, channel capacity and different block coding techniques
- To understand the principle of convolutional coding and different decoding techniques
- To understand the basics of OFDM as a multicarrier communication and CDMA as a multiuser communication technique.

UNIT I COHERENT AND NON-COHERENT COMMUNICATION


UNIT II EQUALIZATION TECHNIQUES


UNIT III BLOCK CODED DIGITAL COMMUNICATION

Architecture and performance – Binary block codes; – Shannon’s channel coding theorem; Channel capacity; Matched filter; Concepts of Spread spectrum communication – Coded BPSK and DPSK demodulators– Linear block codes; Hamming; Golay; Cyclic; BCH ; Reed – Solomon codes. Space time block codes.

UNIT IV CONVOLUTIONAL CODED DIGITAL COMMUNICATION


UNIT V MULTICARRIER AND MULTIUSER COMMUNICATIONS

Single Vs multicarrier modulation, orthogonal frequency division multiplexing (OFDM), Modulation and demodulation in an OFDM system, An FFT algorithmic implementation of an OFDM system, Bit and power allocation in multicarrier modulation, Peak-to-average ratio in multicarrier modulation. Introduction to CDMA systems, multiuser detection in CDMA systems – optimum multiuser receiver, sub-optimum detectors, successive interference cancellation.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

CO1: Differentiate coherent and non coherent receivers and analyse their performance under AWGN channel conditions
CO2: Illustrate the effect of signalling through bandlimited channels and Equalization techniques used to overcome ISI
CO3: Determine the channel capacity and design various block coding techniques to combat
CO4: Construct convolutional coders and analyze the performance of different decoding techniques.

CO5: Describe the basics of OFDM as a multicarrier communication and CDMA as a multiuser communication technique.

TOTAL: 45 PERIODS

REFERENCES:

LIST OF EXPERIMENTS (MATLAB/SCILAB/LABVIEW)
USE APPROPRIATE SIMULATION TOOLS FOR THE FOLLOWING EXPERIMENTS:

1. Generation & detection of binary digital modulation techniques using SDR
2. Spread Spectrum communication system-Pseudo random binary sequence generation-Baseband DSSS.
3. MIMO system transceiver design using MATLAB/SCILAB/LABVIEW
4. Performance evaluation of simulated CDMA system
5. Channel Coder/decoder design (block codes / convolutional codes/ turbo codes)
6. OFDM transceiver design using MATLAB /SCILAB/LABVIEW
7. Channel equalizer design using MATLAB (LMS, RLS algorithms)
8. Design and Analysis of Spectrum Estimators (Bartlett, Welch) using MATLAB
9. BER performance Analysis of M-ary digital Modulation Techniques (coherent & non coherent) in AWGN Environment using MATLAB/SCILAB/LABVIEW
10. Design and performance analysis of Lossless Coding Techniques - Huffman Coding and Lempel Ziv Algorithm using MATLAB/SCILAB/LABVIEW
12. Study of synchronization (frame, bit, symbol.)

TOTAL : 45 PERIODS
COURSE OUTCOMES:

Upon the completion of course, students are able to

- Implement the adaptive filtering algorithms
- Generate and detect digital communication signals of various modulation techniques using MATLAB.
- Evaluate cellular mobile communication technology and propagation model.
- Apply mathematical formulation to analyze spectrum estimation of a signal and bit rate determination of a transmission link
- Analyze the performance of optimization algorithms for equalizing the channel or noise/echo cancellation
- Able to design synchronization algorithm for Digital Communication systems

EL4111 EMBEDDED SYSTEM DESIGN LABORATORY

COURSE OBJECTIVES:

- To interface sensors and display devices with ARM processor.
- To program timers and UART in ARM processor.
- To understand I2C and CAN protocols.
- To understand concepts of scheduling, semaphores and deadlocks using RTOS.
- To design a real – time data acquisition system using ARM Cortex Processor.

LIST OF EXPERIMENTS:

1. Interfacing sensors and actuators with ARM core.
2. Configuration and programming timers and UART in ARM Processor.
3. Interfacing LCD and OLED display modules with ARM Processor.
4. Simulation of I2C and CAN protocols.
5. Simple task scheduling using freeware RTOS.
6. Exploration on semaphores, deadlocks using RTOS.
7. Exploration of any one SOC architecture using RTOS.
8. Study of Edge AI platform on any one of the embedded processors.
9. Design of a real – time data acquisition system and control using ARM Processor.
10. Design of an IoT based system.

COURSE OUTCOMES:

CO1: Interface an ARM processor with input – output devices.
CO2: Understand I2C and CAN protocols.
CO3: Explore concepts in RTOS.
CO4: Design a real – time embedded system.
CO5: Analyse design requirements of an IoT based system.

TOTAL:45 PERIODS

REFERENCES:

COURSE OBJECTIVES:

- To understand the characteristics and advancements of UMTS and LTE Architecture.
- Understand the 5G Building blocks and Use Cases.
- Understand various wireless networking standards such as 4G and 5G.
- To understand 5G Networking principles.
- To have a good understanding of emerging wireless networks such as massive machine type communication.

UNIT I  4G ARCHITECTURE  10

UNIT II  5G ARCHITECTURE AND MILLIMETER WAVE COMMUNICATIONS  8

UNIT III  5G WAVEFORMS AND CHANNEL MODELS  9

UNIT IV  NETWORKING IN 5G  9

UNIT V  EVALUATION OF 5G AND 5G APPLICATIONS  9

45 PERIODS

SUGGESTED ACTIVITIES:
1: Modeling of 4G LTE – A System
2: Design of Radio Network Access for 4G Networks
3: Modeling of 5G Networks
4: Design of Radio Network Access for 5G Systems
5: Design of Smart Antenna System
PRACTICALS:
1. Modeling a 4G LTE System
2. Test and Measurement of 4G LTE Baseband signals
3. Design of MIMO System
4. Analysis and study of millimetre wave applications
5. Simulation of NOMA Principles
6. METIS Modeling
7. Simulation of Joint Transmission CoMP
8. Analysis of buffer-aided relaying
9. Design of Massive MTC.
10 Implementation and testing of Device to Device Communication

30 PERIODS

COURSE OUTCOMES:
Upon completion of the course, the student will be able to
CO1: Understand and develop 4G LTE Networks
CO2: Understand and develop 5G Building blocks
CO3: Understand and develop 5G Radio Access Technologies
CO4: Understand and develop Networking in 5G
CO5: Understand and develop Device to Device Communication

TOTAL:75 PERIODS

REFERENCES

EL4202 FPGA BASED SYSTEM DESIGN

COURSE OBJECTIVES:
- To learn the different types of programming elements, programmable logic blocks, programmable input-output blocks and programmable interconnects of various types of FPGAs
- To understand the steps involved in synthesis, simulation, and testing of systems
- To design and implement circuits, subsystem and system using FPGA and I/O boards
UNIT I FPGA ARCHITECTURES


UNIT II FPGA DESIGN FLOW


UNIT III FPGA BASED SUBSYSTEM DESIGN


UNIT IV FPGA BASED SYSTEM DESIGN


UNIT V FPGA BASED PROJECT DESIGN


COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Understand the basic concepts of FPGA and its structures
CO2: Understand the steps involved in synthesis, simulation, and testing of systems
CO3: Design combinational and arithmetic circuits using FPGA board
CO4: Design memories and DCTQ processor.
CO5: Design real time applications using FPGA board

REFERENCES

2. Hideharu Amano, “Principles and Structures of FPGAs”, Springer, 2018

TOTAL: 45 PERIODS
COURSE OBJECTIVES:
- To understand Antenna basics
- To learn about Antenna arrays and their characteristics
- To study about operating Antennas
- To familiarize with modern Antennas and Measurement Techniques
- To learn about recent trends in Antenna Design

UNIT I  
ANTENNA FUNDAMENTALS & WIRE ANTENNAS  

UNIT II  
ANTENNA ARRAYS  
Linear array – uniform array, end fire and broad side array, gain, beam width, side lobe level; Linear array synthesis techniques – Binomial and Chebyshev distributions; Two dimensional uniform arrays; phased array antennas, smart antennas, switched beam and adaptive arrays, Mutual Coupling in Finite Arrays

UNIT III  
APERTURE ANTENNAS  
Field equivalence principle, Radiation from Rectangular and Circular apertures, Babinet’s principle, Slot antenna; Horn antenna; Reflector antenna, aperture blockage, and design consideration. Radiation Mechanism and Excitation techniques, Microstrip dipole; Patch, Rectangular patch, Circular patch – Microstrip array and feed network; Lens Antennas

UNIT IV  
MODERN ANTENNAS & MEASUREMENT TECHNIQUES  
Base station antennas, PIFA – Antennas for WBAN – RFID Antennas – Automotive antennas, MIMO Antennas, Diversity techniques – Antenna impedance and radiation pattern measurements

UNIT V  
RECENT TRENDS IN ANTENNA DESIGN  
UWB antenna arrays – Vivaldi antenna arrays – Artificial magnetic conductors/High impedance surfaces – Antennas in medicine – Plasma antennas – Antennas for millimeter wave communication - optimization techniques – Numerical methods

SUGGESTED ACTIVITIES:
1. Design and develop an antenna to receive AM and FM radio
2. Design Yagi-Uda Antenna at very high frequency band
3. Design Microstrip patch antenna for mobile applications
4. Design and develop Microstrip dipole antenna
5. Design reflector antenna for satellite - TV reception

TOTAL: 45 PERIODS
COURSE OUTCOMES:
At the end of the course, the student will be able to:

CO1: Understand the fundamentals behind the different techniques in antenna technology.
CO2: Understand the challenges associated in designing antennas based on different technologies.
CO3: Understand the capability and assess the performance of various antennas.
CO4: Identify the antennas specific to the applications, design and characterize.
CO5: Understand the need for optimizing in antenna design and the methodologies for the same.

REFERENCES:

EL4291 TELECOMMUNICATION SYSTEM MODELING AND SIMULATION

COURSE OBJECTIVES:
- To enable the student to understand the various aspects of simulation methodology and performance.
- To appreciate the significance of selecting sampling frequency and modeling different types of signals and processing them.
- To expose the student to the different simulation techniques, their pros and cons and enable him to understand and interpret results using case studies.

UNIT I SIMULATION METHODOLOGY
Introduction, Aspects of methodology, Performance Estimation, Simulation sampling frequency, Low pass equivalent simulation models for bandpass signals, Multicarrier signals, Non-linear and time-varying systems, Post processing – Basic graphical techniques and estimations.

UNIT II RANDOM SIGNAL GENERATION & PROCESSING
Uniform random number generation, Mapping uniform random variables to an arbitrary pdf, Correlated and Uncorrelated Gaussian random number generation, PN sequence generation, Random signal processing, Testing of random number generators.

UNIT III MONTE CARLO SIMULATION
Fundamental concepts, Application to communication systems, Monte Carlo integration, Semi-analytic techniques, Case study: Performance estimation of a wireless system.

UNIT IV ADVANCED MODELS & SIMULATION TECHNIQUES
Modeling and simulation of non-linearities : Types, Memoryless non-linearities, Non-linearities with
memory, Modeling and simulation of Time varying systems: Random process models, Tapped
delay line model, Modeling and simulation of waveform channels, Discrete memoryless channel
models, Markov model for discrete channels with memory.

UNIT V  EFFICIENT SIMULATION TECHNIQUES
Tail extrapolation, pdf estimators, Importance Sampling methods, Case study: Simulation of a
Cellular Radio System.

PRACTICALS:
1. Study the spectrum of response of linear and non-linear systems for single tone input
2. Generation of OFDM (multicarrier) signal and plot the spectrum (RF and Low pass equivalent)
3. Generation of uniform / Gaussian random numbers and verification of their probability
distribution, autocorrelation and spectrum
4. Generation of uncorrelated and correlated random processes and verification of cross-
correlations
5. Generation of PN sequence and verification of properties and spectrum.
6. Application of Monte Carlo simulation for estimation of BER of a wireless communication link
7. Study the impact of non-linearity of amplifier on transmitter symbol constellation with the help
of Saleh model
8. Studying the effect of time invariant (slow fading) frequency selecting channel with the help of
symbol constellation
9. Studying the effect of time variant flat fading (memoryless) channel with the help of symbol
constellation

COURSE OUTCOMES:
Upon completion of the course the student will be able to
CO1: Understand the different signal generation and processing methods
CO2: Mathematically model a physical phenomena.
CO3: Simulate a phenomena so as to depict the characteristics that may be observed in a real
experiment.
CO4: Apply knowledge of the different simulation techniques for designing a communication system
or channel
CO5: Validate a simulated system performance so as to match a realistic scenario
TOTAL: 75 PERIODS

REFERENCES
2. M.C. Jeruchim, P.Balaban and K. Sam Shanmugam, Simulation of Communication Systems:
2000.
5. Jerry Banks and John S. Carson, Discrete Event System Simulation, Prentice Hall of India,
1984.
EL4211  FPGA BASED SYSTEM DESIGN LABORATORY  L T P C  0 0 4 2

COURSE OBJECTIVES
- To understand Verilog and VHDL in modelling of digital circuits and systems.
- To understand the principles of modelling, simulation, synthesis and implementation of digital circuits and systems using FPGA and I/O boards.

LIST OF EXPERIMENTS
2. Sequential Circuits: D Flip-flop - Registers - Shift Registers - Counters - Finite State Machines - Pattern Sequence Detector.

TOTAL:60 PERIODS

COURSE OUTCOMES
On successful completion of this course, the student will be able to
CO1: Able to design and implement various combinational circuits using FPGA boards
CO2: Able to design and implement various sequential circuits using FPGA boards
CO3: Able to design and implement various arithmetic circuits using FPGA boards
CO4: Create and import logic modules into FPGA, synthesize and analyze the module with FPGA and I/O boards

EL4212  TERM PAPER WRITING AND SEMINAR  L T P C  0 0 2 1

In this course, students will develop their scientific and technical reading and writing skills that they need to understand and construct research articles. A term paper requires a student to obtain information from a variety of sources (i.e., Journals, dictionaries, reference books) and then place it in logically developed ideas. The work involves the following steps:

1. Selecting a subject, narrowing the subject into a topic
2. Stating an objective.
3. Collecting the relevant bibliography (atleast 15 journal papers)
4. Preparing a working outline.
5. Studying the papers and understanding the authors contributions and critically analysing each paper.
6. Preparing a working outline
7. Linking the papers and preparing a draft of the paper.
8. Preparing conclusions based on the reading of all the papers.
9. Writing the Final Paper and giving final Presentation
Please keep a file where the work carried out by you is maintained.
Activities to be carried out

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<th>Activity</th>
<th>Instructions</th>
<th>Submission week</th>
<th>Evaluation</th>
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<tbody>
<tr>
<td>Selection of area of interest and Topic</td>
<td>You are requested to select an area of interest, topic and state an objective</td>
<td>2nd week</td>
<td>3 % Based on clarity of thought, current relevance and clarity in writing</td>
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<tr>
<td>Stating an Objective</td>
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<tr>
<td>Collecting Information about your area &amp; topic</td>
<td>1. List 1 Special Interest Groups or professional society</td>
<td>3rd week</td>
<td>3% (the selected information must be area specific and of international and national standard)</td>
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<td>2. List 2 journals</td>
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<td>3. List 2 conferences, symposia or workshops</td>
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<td>4. List 1 thesis title</td>
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<td>5. List 3 web presences (mailing lists, forums, news sites)</td>
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<td>6. List 3 authors who publish regularly in your area</td>
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<td>7. Attach a call for papers (CFP) from your area.</td>
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<tr>
<td>Collection of Journal papers in the topic in the context of the objective – collect 20 &amp; then filter</td>
<td>• You have to provide a complete list of references you will be using. Based on your objective - Search various digital libraries and Google Scholar. When picking papers to read - try to: • Pick papers that are related to each other in some ways and/or that are in the same field so that you can write a meaningful survey out of them, • Favour papers from well-known journals and conferences, • Favour “first” or “foundational” papers in the field (as indicated in other people’s survey paper), • Favour more recent papers, • Pick a recent survey of the field so you can quickly gain an overview, • Find relationships with respect to each other and to your topic area (classification scheme/categorization) • Mark in the hard copy of papers</td>
<td>4th week</td>
<td>6% (the list of standard papers and reason for selection)</td>
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<td>Reading and notes for first 5 papers</td>
<td>Reading Paper Process</td>
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<td>For each paper form a Table answering the following questions:</td>
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<td></td>
<td>- What is the main topic of the article?</td>
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<td>- How does the work build on other’s work, in the author’s opinion?</td>
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<td>- How did the author claim they were going to evaluate their work and compare it to others?</td>
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<td>- What did the author say were the limitations of their research?</td>
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<td>- What did the author say were the important directions for future research?</td>
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<td>Conclude with limitations/issues not addressed by the paper (from the perspective of your survey)</td>
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<th>Reading and notes for next 5 papers</th>
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<th>Reading and notes for final 5 papers</th>
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<td>(the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)</td>
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<td>Draft outline 1 and Linking papers</td>
<td>Prepare a draft Outline, your survey goals, along with a classification / categorization diagram</td>
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<td>Abstract</td>
<td>Prepare a draft abstract and give a presentation</td>
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<td>Introduction Background</td>
<td>Write an introduction and background sections</td>
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<td>Sections of the paper</td>
<td>Write the sections of your paper based on the classification / categorization diagram in keeping with the goals of your survey</td>
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<td>Your conclusions</td>
<td>Write your conclusions and future work</td>
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<td>Final Draft</td>
<td>Complete the final draft of your paper</td>
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<td>Seminar</td>
<td>A brief 15 slides on your paper</td>
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**TOTAL: 30 PERIODS**

**EL4391**  
**OPTICAL NETWORKS**  
**L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES:**

- Understand the concepts of optical components and networks.
- To gain an understanding of various issues in designing a high speed, and huge bandwidth optical network.
- To acquire knowledge of architecture and standards of optical networks.
- Thorough knowledge about the routing and access mechanism in optical networks.
- Thorough understanding of the scientific and engineering principles underlying the photonics technology.
UNIT I OPTICAL SYSTEM COMPONENTS

UNIT II OPTICAL NETWORK ARCHITECTURES
Introduction to Optical Networks; WDM networks , SONET / SDH, Metropolitan-Area Networks, Layered Architecture; Broadcast and Select Networks- Topologies for Broadcast Networks, Media-Access Control Protocols, Wavelength Routing Architecture. WOBAN and OTDM networks. Introduction to ASON.

UNIT III WAVELENGTH ROUTING NETWORKS
The Optical layer, Node Designs, Optical layer cost tradeoff, Routing and Wavelength Assignment algorithms, Virtual Topology design, Architectural variations

UNIT IV PACKET SWITCHING AND ACCESS NETWORKS

UNIT V NETWORK DESIGN AND MANAGEMENT
 Transmission system Engineering-system model, Power penalty-transmitter, receiver, Optical amplifiers, crosstalk, dispersion, wavelength stabilization; overall design consideration; Control and Management-Network management functions, Configuration management, Performance management, Fault management. Optical safety, Service interface.

COURSE OUTCOMES:
On completion of the course the student will be
CO1: able to design state-of-the-art optical networks.
CO2: able to implement optical network protocols.
CO3: able to design high speed networks using optical fibers
CO4: able to simulate access network
CO5: able to design the optical network infrastructure and network management methods.

TOTAL: 45 PERIODS

REFERENCES
COURSE OBJECTIVES:
- Apply the knowledge of device physics in modeling of integrated diode.
- Analyze and model MOS capacitor.
- Analyze and model MOSFET, FINFET and UTB.
- Analyze and model MESFET, HBT, HEMT MODFET,
- Analyze and model Optoelectronic Devices

UNIT I INTRODUCTION TO SEMICONDUCTOR PHYSICS AND DIODE MODELLING
10
Review of Quantum Mechanics - Boltzman transport equation - Continuity equation - Poisson equation. Junction and Schottky diodes in monolithic technologies - static and dynamic behavior - small and large signal models . SPICE modeling and simulation of PN junction and Schottky diode.

UNIT II INTEGRATED MOS CAPACITANCE :: 8
Band diagram- flat band condition and flat band voltage-surface accumulation, surface depletion-threshold condition and threshold voltage, charge versus gate voltage, MOS C-V Characteristics, Poly Si gate depletion-effective Increase In Tox.

UNIT III INTEGRATED MOS TRANSISTOR 11
NMOS and PMOS Transistor - Threshold voltage - Threshold voltage equations - MOS device equations - Basic DC equations Second order effects - Small signal AC Characteristics- MOS models SPICE model, EKV Model, BSIM Model. Technology scaling for cost, speed and power consumption, Subthreshold Current -Subthreshold Swing, Threshold voltage Roll Off-Short Channel Leakage, reducing gate insulator electrical thickness And Tunneling Leakage, Short Channel Effects. Ultra Thin body, SOI and Multigate MOSFET - FINFET. Compact Model for Circuit Simulation using Verilog A.

UNIT IV ADVANCED SEMICONDUCTOR DEVICES 8
MESFETs, HBTs, HEMTs, MOSFETs.

UNIT V OPTOELECTRONICS DEVICES 8
Light Emitting Diodes, Lasers, Photoconductors, Junction Photodiodes, Avalanche Photodiodes, Solar Cells

TOTAL:45 PERIODS

SUGGESTED ACTIVITIES:
1: Expert Lectures from the Faculty guiding in the area of Device Modelling
2: Using facilities in https://nanohub.org/ for online simulation of devices
3. Usage of Synopsis/ Silvaco TCAD is required

COURSE OUTCOMES:
Upon completion of the course the student will be able to
CO1: Acquire the knowledge of modelling of integrated diode
CO2: Model and simulate MOS capacitor for different values of process and operating parameters
CO3: Model and simulate SPICE, EKV and BSIM model of MOSFETs
CO4: Acquire the knowledge of modelling Sol, multigate MOSFET, UTB and FINFET devices
CO5: Acquire the knowledge of modelling of Optoelectronic devices
REFERENCES

EL4002  SMART SENSORS FOR HEALTHCARE L T P C
3 0 0 3

COURSE OBJECTIVES:
- To introduce different types of electrodes used in bio potential recording
- To provide an overview of smart sensors and the associated signal processing
- Gain knowledge for implementing different types of physiological parameter measurement using appropriate sensors
- To introduce smart chemical sensors
- To present an overview of the direction of future health care system

UNIT I  BIOPOTENTIAL ELECTRODES

UNIT II  SMART SENSORS

UNIT III  PHYSICAL SENSORS IN BIOMEDICINE

UNIT IV  CHEMICAL BIOSENSORS
Field Effect Transistor Technologies for Biological and Chemical Sensors -Electrochemical sensor, Chemical fibrosensors, Noninvasive blood gas monitoring-Blood glucose sensors-Electronic noses-gamma radiation dosimeter.

UNIT V  NEXT GENERATION HEALTHCARE

TOTAL: 45 PERIODS
COURSE OUTCOMES:
On completion of the course the student will be
CO1: Able to understand about the different types of bio-potential electrodes
CO2: Able to design systems with smart sensors
CO3: Ability to use appropriate sensors as well as to measure and analyze the physiological parameters obtained
CO4: Able to design chemical sensors for typical issues
CO5: Ability to understand the role of upcoming technology in future healthcare

REFERENCES

EL4003 NANO ELECTRONICS L T P C
3 0 0 3

COURSE OBJECTIVES:
- To understand design of transistor as Nano device
- To understand various forms of Nano Devices
- To understand properties of different types of Nano Sensors

UNIT I SEMICONDUCTOR AND NANODEVICES 9
Single-Electron Devices; Nano scale MOSFET – Resonant Tunneling Transistor - Single-Electron Transistors; Nanorobotics and Nanomanipulation; Mechanical Molecular Nanodevices; Nano Computers: Optical Fibers for Nanodevices; Photochemical Molecular Devices; DNA-Based Nanodevices; Gas-Based Nanodevices

UNIT II ELECTRONICS AND PHOTONIC MOLECULAR MATERIALS 9

UNIT III THERMAL SENSORS 9
Thermal energy sensors - temperature sensors, heat sensors - Electromagnetic sensors - electrical resistance sensors, electrical current sensors, electrical voltage sensors, electrical power sensors, magnetism sensors - Mechanical sensors - pressure sensors, gas and liquid flow sensors, position sensors - Chemical sensors - Optical and radiation sensors.
UNIT IV  GAS SENSOR MATERIALS  
Criteria for the choice of materials - Experimental aspects – materials, properties, measurement of gas sensing property, sensitivity; Discussion of sensors for various gases, Gas sensors based on semiconductor devices

UNIT V  BIOSENSORS  
Principles - DNA based biosensors – Protein based biosensors – materials for biosensor applications - fabrication of biosensors - future potential.

COURSE OUTCOMES:  
Upon completion of the course the student will have the  
CO1: Ability to design and simulate nanodevices  
CO2: Ability to design and simulate nano sensors  
CO3: Ability to characterise thermal sensors  
CO4: Ability to characterise the materials used for gas sensors  
CO5: Ability to characterise biosensors  

TOTAL:45 PERIODS

REFERENCES - Recent Reference books may be included  

AP4071  COMPUTER ARCHITECTURE AND PARALLEL PROCESSING  
L T P C  
3 0 0 3

COURSE OBJECTIVES:  
- Discuss the basic concepts and structure of computers.  
- Explain the concepts of number representation and arithmetic operations.  
- Explain different types of Memory architectures.  
- Describe various parallel processing schemes and vector architecture.  
- Summarize the Instruction execution stages and Memory hierarchy.

UNIT I  INTRODUCTION TO COMPUTER ORGANIZATION  

UNIT II  DATA REPRESENTATION  
Signed number representation, fixed and floating point representations, character representation. Computer arithmetic - integer addition and subtraction, ripple carry adder, carry look-ahead adder - multiplication - shift-and-add, Booth multiplier, carry save multiplier - Division - non-restoring and restoring techniques, floating point arithmetic.

UNIT III  PROCESSOR ARCHITECTURE AND CONTROL UNIT  
UNIT IV PARALLEL PROCESSING
Parallel processing challenges – Flyn’s classification – Single Instruction Single Data (SISD), Multiple Instruction Multiple Data (MIMD), Single Instruction Multiple Data (SIMD), Single Program Multiple Data (SPMD), and Vector Architectures - Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors - Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

UNIT V MEMORY & I/O SYSTEMS

COURSE OUTCOMES
Upon completion of this course, the student will be able to

CO1: Understand the basic organization of computer and different instruction formats and addressing modes. (K2)
CO2: Interpret the representation and manipulation of data on the computer. (K3)
CO3: Illustrate about implementation schemes of control unit and pipeline performance. (K2)
CO4: Summarize the various types of parallelism architectures. (K2)
CO5: Compare the various memory hierarchy and I/O systems. (K2)

REFERENCE BOOKS

EL4071 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY

COURSE OBJECTIVES:
- To gain broad conceptual understanding of the various aspects of electromagnetic (EM) interference and compatibility
- To develop a theoretical understanding of electromagnetic shielding effectiveness
- To understand ways of mitigating EMI by using shielding, grounding and filtering
- To understand the need for standards and to appreciate measurement methods
- To understand how EMI impacts wireless and broadband technologies

UNIT I INTRODUCTION & SOURCES OF EM INTERFERENCE
Introduction - Classification of sources - Natural sources - Man-made sources - Survey of the electromagnetic environment.
UNIT II  EM SHIELDING  
Introduction - Shielding effectiveness - Far-field sources - Near-field sources - Low-frequency, magnetic field shielding - Effects of apertures

UNIT III  INTERFERENCE CONTROL TECHNIQUES  

UNIT IV  EMC STANDARDS, MEASUREMENTS AND TESTING  
Need for standards - The international framework - Human exposure limits to EM fields - EMC measurement techniques - Measurement tools - Test environments.

UNIT V  EMC CONSIDERATIONS IN WIRELESS AND BROADBAND TECHNOLOGIES  
Efficient use of frequency spectrum - EMC, interoperability and coexistence - Specifications and alliances - Transmission of high-frequency signals over telephone and power networks - EMC and digital subscriber lines - EMC and power line telecommunications.

SUGGESTED ACTIVITIES:
1. Investigate various case studies related to EMIC. Example: Chernobyl Disaster in 1986.
2. Develop some understanding about the design of EM shields in electronic system design and packaging.

COURSE OUTCOMES:
Upon completion of this course, the student will be able to
CO1: Demonstrate knowledge of the various sources of electromagnetic interference
CO2: Display an understanding of the effect of how electromagnetic fields couple through apertures, and solve simple problems based on that understanding
CO3: Explain the EMI mitigation techniques of shielding and grounding
CO4: Explain the need for standards and EMC measurement methods
CO5: Discuss the impact of EMC on wireless and broadband technologies

TOTAL: 45 PERIODS

REFERENCES

AP4095  SIGNAL INTEGRITY FOR HIGH SPEED DESIGN  L T P C
3 0 0 3

COURSE OBJECTIVES:
- To identify sources affecting the speed of digital circuits.
- To introduce methods to improve the signal transmission characteristics
UNIT I  SIGNAL PROPAGATION ON TRANSMISSION LINES  9
Transmission line equations, wave solution, wave vs. circuits, initial wave, delay time, Characteristic impedance, wave propagation, reflection, and bounce diagrams Reactive terminations – L, C, static field maps of microstrip and strip line cross-sections, per unit length parameters, PCB layer stackups and layer/Cu thicknesses, cross-sectional analysis tools, Zo and Td equations for microstrip and stripline Reflection and terminations for logic gates, fan-out, logic switching, input impedance into a transmission-line section, reflection coefficient, skin-effect, dispersion.

UNIT II  MULTI-CONDUCTOR TRANSMISSION LINES AND CROSS-TALK  9
Multi-conductor transmission-lines, coupling physics, per unit length parameters, Near and far-end cross-talk, minimizing cross-talk (stripline and microstrip) Differential signalling, termination, balanced circuits, S-parameters, Lossy and Lossless models.

UNIT III  NON-IDEAL EFFECTS  9
Non-ideal signal return paths – gaps, BGA fields, via transitions, Parasitic inductance and capacitance, Transmission line losses – Rs, tanδ, routing parasitic, Common-mode current, differential-mode current, Connectors.

UNIT IV  POWER CONSIDERATIONS AND SYSTEM DESIGN  9
SSN/SSO, DC power bus design, layer stack up, SMT decoupling, Logic families, power consumption, and system power delivery, Logic families and speed Package types and parasitic, SPICE, IBIS models, Bit streams, PRBS and filtering functions of link-path components, Eye diagrams, jitter, inter-symbol interference Bit-error rate, Timing analysis.

UNIT V  CLOCK DISTRIBUTION AND CLOCK OSCILLATORS  9
Timing margin, Clock slew, low impedance drivers, terminations, Delay Adjustments, canceling parasitic capacitance, Clock jitter.

TOTAL : 45 PERIODS

COURSE OUTCOMES:
At the end of the course the student will be able to
CO1: identify sources affecting the speed of digital circuits.
CO2: identify methods to improve the signal transmission characteristics
CO3: characterise and model multiconductor transmission line
CO4: analyse clock distribution system and understand its design parameters
CO5: analyse nonideal effects of transmission line

REFERENCES
TOOLS REQUIRED
1. SPICE, source - http://www-cad.eecs.berkeley.edu/Software/software.html
3. SPECTRAQUEST from Cadence, http://www.spectraquest.com or any equivalent open source tool

CU4074 SPEECH PROCESSING

COURSE OBJECTIVES:
- To introduce speech production and related parameters of speech.
- To illustrate the concepts of speech signal representations and coding.
- To understand different speech modeling procedures such Markov and their implementation issues.
- To gain knowledge about text analysis and speech synthesis.

UNIT I FUNDAMENTALS OF SPEECH PROCESSING

UNIT II SPEECH SIGNAL REPRESENTATIONS AND CODING

UNIT III SPEECH RECOGNITION

UNIT IV TEXT ANALYSIS

UNIT V SPEECH SYNTHESIS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
- CO1: Model speech production system and describe the fundamentals of speech.
- CO2: Extract and compare different speech parameters.
- CO3: Choose an appropriate statistical speech model for a given application.
- CO4: Design a speech recognition system.
- CO5: Use different text analysis and speech synthesis techniques.

TOTAL: 45 PERIODS
REFERENCES

EL4004 CRYPTOGRAPHY AND NETWORK SECURITY L T P C
3 0 0 3

COURSE OBJECTIVES:
- To understand the importance and goals of communication network and information security and introduce them to the different types of attacks.
- To expose different approaches to handling security and the algorithms in use for maintaining data integrity and authenticity.
- To appreciate the practical aspects of security features design and their implementation in wired and wireless internetworking domains.

UNIT I INTRODUCTION ON SECURITY

UNIT II SYMMETRIC & ASYMMETRIC KEY ALGORITHMS
Introduction to Block Ciphers and Stream Ciphers, Data Encryption Standards (DES), Advanced Encryption Standard (AES), RC4, Principle of asymmetric key algorithms, RSA Cryptosystem.

UNIT III INTEGRITY, AUTHENTICATION AND KEY MANAGEMENT

UNIT IV NETWORK SECURITY, FIREWALLS AND WEB SECURITY
Introduction on Firewalls, Types of Firewalls, IP Security, E-mail security: PGP- S/MIME, Web security: SSL-TLS, SET.

UNIT V WIRELESS NETWORK SECURITY
COURSE OUTCOMES:
Upon completion of this course, the students will be
CO1: Able to demonstrate an understanding of the ways in which communication network security may get compromised and the basic principles of security algorithm design.
CO2: Familiar with the different types of security attacks, approaches to handling security and the algorithms in use for maintaining data integrity and authenticity
CO3: Able to implement and analyse the different algorithms and compare their performances.
CO4: Able to appreciate the practical aspects of security features design and their implementation in wired and wireless internetworking domains
CO5: In a position to apply his knowledge for designing or modifying existing algorithms and implementing using simulation.

TOTAL: 45 PERIODS

REFERENCES

EL4005 COGNITIVE RADIO L T P C 3 0 0 3

COURSE OBJECTIVES:
- To understand the evolving paradigm of cognitive radio communication and the enabling technologies for its implementation.
- To understand the essential functionalities and requirements in designing software defined radios and their usage for cognitive communication.
- To expose evolving next generation wireless networks and their associated challenges.

UNIT I SOFTWARE DEFINED RADIO AND ITS ARCHITECTURE
Definitions and potential benefits, software radio architecture evolution, technology tradeoffs and architecture implications. Essential functions of the software radio, basic SDR, hardware architecture, Computational processing resources, software architecture, top level component interfaces, interface topologies among plug and play modules.
UNIT II  COGNITIVE RADIOS AND ITS ARCHITECTURE
Marking radio self-aware, cognitive techniques – position awareness, environment awareness in
cognitive radios, optimization of radio resources, Artificial Intelligence Techniques, Cognitive Radio –
functions, components and design rules, Cognition cycle – orient, plan, decide and act phases,
Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture on Software
defined Radio Architecture.

UNIT III  SPECTRUM SENSING AND IDENTIFICATION
Primary Signal Detection: Energy Detector, Cyclostationary Feature Detector, Matched Filter
,Cooperative Sensing, Definition and Implications of Spectrum Opportunity, Spectrum Opportunity
Detection, Fundamental Trade-offs: Performance versus Constraint, MAC Layer Performance
Measures, Global Interference Model, Local Interference Model, Fundamental Trade-offs: Sensing
Accuracy versus Sensing Overhead.

UNIT IV  USER COOPERATIVE COMMUNICATIONS
User Cooperation and Cognitive Systems , Relay Channels: General Three-Node Relay Channel,
Wireless Relay Channel, User Cooperation in Wireless Networks: Two-User Cooperative Network,
Cooperative Wireless Network, Multihop Relay Channel

UNIT V  INFORMATION THEORETICAL LIMITS ON CR NETWORKS
Types of Cognitive Behavior, Interference-Avoiding Behavior: Spectrum Interweave, Interference-
Controlled Behavior: Spectrum Underlay, Underlay in Small Networks: Achievable Rates, Underlay in
Large Networks: Scaling Laws, Interference-Mitigating Behavior: Spectrum Overlay, Opportunistic
Interference Cancellation, Asymmetrically Cooperating Cognitive Radio Channels.

COURSE OUTCOMES:
On completion of the course the student will be able to
CO1: Appreciate the motivation and the necessity for cognitive radio communication strategies.
CO2: Demonstrate understanding of the enabling technologies for its implementation
CO3: Demonstrate understanding of the essential functionalities and requirements in designing
software defined radios and their usage for cognitive communication.
CO4: Evolve new techniques and demonstrate their feasibility using mathematical validations and
simulation tools.
CO5: Demonstrate the impact of the evolved solutions in future wireless network design.

TOTAL: 45 PERIODS

REFERENCES
Communications and Networks - Principles And Practice”, Elsevier Inc. , 2010.
2. Kwang-Cheng Chen and Ramjee Prasad, “Cognitive Radio Networks”, John Wiley & Sons,
Ltd, 2009.
on selected areas in communications, Feb 2005.
dynamic spectrum access / cognitive radio wireless networks: A Survey Elsevier Computer
Networks”, May 2006.
COURSE OBJECTIVES:

- To enable the student to understand the necessity for satellite based communication, the essential elements involved and the transmission methodologies.
- To enable the student to understand the different interferences and attenuation mechanisms affecting the satellite link design.
- To expose the student to the advances in satellite based navigation, GPS and the different application scenarios.

UNIT I  ELEMENTS OF SATELLITE COMMUNICATION  
Satellite Systems, Orbital description and Orbital mechanics of LEO, MEO and GSO, Placement of a Satellite in a GSO, Antennas and earth coverage, Altitude and eclipses, Satellite drift and station keeping, Satellite – description of different Communication subsystems, Bandwidth allocation

UNIT II  SATELLITE SPACE SEGMENT AND ACCESS  
Introduction; attitude and orbit control system; telemetry, tracking and command; power systems, communication subsystems, antenna subsystem, equipment reliability and space qualification, Multiple Access: Demand assigned FDMA - SPADE system - TDMA - satellite switched TDMA – CDMA.

UNIT III  SATELLITE LINK DESIGN  
Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionospheric characteristics, Link Design: System noise temperature and G/T ratio, Downlink and uplink design, C/N, Link Design with and without frequency reuse, link margins, Error control for digital satellite link.

UNIT IV  SATELLITE BASED BROADBAND COMMUNICATION  

UNIT V  SATELLITE NAVIGATION AND GLOBAL POSITIONING SYSTEM  

COURSE OUTCOMES:

At the end of the course the student would be
CO1: Able to demonstrate an understanding of the basic principles of satellite based communication the essential elements involved and the transmission methodologies.
CO2: Familiar with satellite orbits, placement and control, satellite link design and the communication system components.
CO3: Able to demonstrate an understanding of the different interferences and attenuation mechanisms affecting the satellite link design.
CO4: The student would be able to demonstrate an understanding of the different communication, sensing and navigational applications of satellite.
CO5: Familiar with the implementation aspects of existing satellite based systems

TOTAL: 45 PERIODS
REFERENCES

MU4091 MULTIMEDIA COMPRESSION TECHNIQUES

COURSE OBJECTIVES:
• To understand the basic ideas of compression algorithms related to multimedia components – Text, speech, audio, image and Video.
• To understand the principles and standards and their applications with an emphasis on underlying technologies, algorithms, and performance.
• To appreciate the use of compression in multimedia processing applications
• To understand and implement compression standards in detail

UNIT I FUNDAMENTALS OF COMPRESSION

UNIT II TEXT COMPRESSION

UNIT III IMAGE COMPRESSION

UNIT IV AUDIO COMPRESSION

UNIT V VIDEO COMPRESSION
COURSE OUTCOMES:
Upon Completion of the course, the students should be able to

CO1: Implement basic compression algorithms familiar with the use of MATLAB and its equivalent open source environments
CO2: Design and implement some basic compression standards
CO3: Critically analyze different approaches of compression algorithms in multimedia related mini projects.
CO4: Understand the various audio, speech compression techniques
CO5: Understand and implement MPEG video coding techniques.

REFERENCES

VL4073 MEMS AND NEMS

COURSE OBJECTIVES:
- to introduce the concepts of Micro Electro Mechanical devices.
- to know the fabrication process of microsystems.
- to know the design concepts of micro sensors and micro actuators.
- to familiarize concepts of Quantum Mechanics and Nano systems.

UNIT I OVERVIEW
New trends in Engineering and Science: Micro and Nanoscale systems, introduction to design of MEMS and NEMS, MEMS and NEMS – applications, devices and structures. Materials for MEMS: Silicon, Silicon compounds, polymers, metals

UNIT II MEMS FABRICATION TECHNOLOGIES
Microsystem Fabrication Processes: Photolithography, Ion Implantation, Diffusion, Oxidation. Thin Film Depositions: LPCVD, Sputtering, Evaporation, Electroplating; Etching Techniques: Dry and Wet Etching, Electrochemical Etching; Micromachining: Bulk Micromachining, Surface Micromachining, High Aspect Ratio (LIGA and LIGA-Like) Technology; Packaging: Microsystems Packaging, Essential Packaging Technologies, Selection of Packaging Materials

UNIT III MICRO SENSORS

UNIT IV MICRO ACTUATORS

TOTAL :45 PERIODS
UNIT V  
NANOSYSTEMS AND QUANTUM MECHANICS  
Atomic Structures and Quantum Mechanics, Molecular and Nanostructure Dynamics: Schrodinger Equation and Wave Function Theory, Density Functional Theory, Nanostructures and Molecular Dynamics, Electromagnetic Fields and their Quantization, Molecular Wires and Molecular Circuits

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the student will be able to:

CO1: Discuss micro sensors
CO2: Explain micro actuators
CO3: Outline nanosystems and Quantum mechanics
CO4: Design micro actuators for different applications
CO5: Analyze atomic structures

REFERENCES

AUTOMOTIVE ELECTRONICS

COURSE OBJECTIVES:
- To explain the principle of electronic management system and different sensors used in the systems.
- To know the concepts and develop basic skills necessary to diagnose automotive electronic problems.
- To know starting, and charging, lighting systems, advanced automotive electrical systems.
- To include electronic accessories and basic computer control.
- To explore practically about the components present in an Automotive electrical and electronics system.

UNIT I  
FUNDAMENTALS
Components for electronic engine management system, open and closed loop control strategies, PID control, Look up tables, introduction to modern control strategies like Fuzzy logic and adaptive control. Switches, active resistors, Transistors, Current mirrors/amplifiers, Voltage and current references, Comparator, Multiplier. Amplifier, filters, A/D and D/A converters.

UNIT II  
MODERN SENSORS
Film sensors, micro-scale sensors, Particle measuring systems, Vibration Sensors, SMART sensors, Machine Vision, Multi-sensor systems Applications of Sensors: Applications and case studies of Sensors in Automobile Engineering, Aeronautics, Machine tools and Manufacturing processes.
UNIT III  
**CHARGING SYSTEM**

- Generation of Direct Current
- Shunt Generator Characteristics
- Armature Reaction
- Third Brush Regulation
- Cutout.
- Voltage and Current Regulators
- Compensated Voltage Regulator
- Alternators Principle and Constructional Aspects
- and Bridge Rectifiers
- New Developments.

UNIT IV  
**AUTOMOTIVE TRANSMISSION CONTROL SYSTEMS**

- Transmission control
- Cruise control
- Braking control
- Traction control
- Suspension control
- Steering control
- Stability control
- Integrated engine control.

UNIT V  
**ELECTRONICS SYSTEMS**

- Current Trends in Automotive Electronic Engine Management System
- Types of EMS
- Electromagnetic interference Suppression
- Electromagnetic Compatibility
- Electronic Dashboard Instruments
- Onboard Diagnostic System
- Security
- Warning System
- Infotainment and Telematics.

**SUGGESTED ACTIVITIES:**

1: Testing of battery, starting systems, charging systems, ignition systems and body controller systems

2: Study of various sensors and actuators used in two wheelers and four wheelers for electronic control.


**COURSE OUTCOMES:**

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

**CO1:** Explain the fundamentals, operation, function of various sensors and actuators in engine management systems.

**CO2:** Explain the Automotive Transmission Control Systems.

**CO3:** Enumerate the principles, application, construction and specification of different sensors and actuators usable in typical automobile by suitable testing.

**CO4:** List out the principles and characteristics of charging system components and demonstrate their working with suitable tools.

**CO5:** Describe the principles and architecture of electronics systems and its components present in an automobile related to instrumentation, control, security and warning systems.

**REFERENCES**


COURSE OBJECTIVES:
- To acquire the knowledge about system specification and modelling
- To learn the formulation of partitioning
- To study the different technical aspects about prototyping and emulation

UNIT I SYSTEM SPECIFICATION AND MODELLING 9

UNIT II HARDWARE/SOFTWARE PARTITIONING 9
The Hardware/Software Partitioning Problem, Hardware-Software Cost Estimation, Generation of the Partitioning Graph, Formulation of the HW/SW Partitioning Problem, Optimization, HW/SW Partitioning Based On Heuristic Scheduling, HW/SW Partitioning Based On Genetic Algorithms.

UNIT III HARDWARE/SOFTWARE CO-SYNTHESIS 9
The Co-Synthesis Problem, State-Transition Graph, Refinement and Controller Generation, Distributed System Co-Synthesis Hardware software synthesis algorithms: hardware – software partitioning, distributed system co-synthesis.

UNIT IV PROTOTYPING AND EMULATION 9

UNIT V DESIGN SPECIFICATION AND VERIFICATION 9

COURSE OUTCOMES:
At the end of this course, the students should will be able to:
CO1: describe the broad range of system architectures and design methodologies that currently exist and define their fundamental attributes.
CO2: discuss the dataflow models as a state-of-the-art methodology to solve co-design problems and to optimize the balance between software and hardware.
CO3: understand in translating between software and hardware descriptions through co-design methodologies.
CO4: understand the state-of-the-art practices in developing co-design solutions to problems using modern hardware/software tools for building prototypes.

CO5: understand the concurrent specification from an algorithm, analyze its behavior and partition the specification into software (C code) and hardware (HDL) components

TOTAL: 45 PERIODS

REFERENCES

AP4092 EDGE ANALYTICS AND INTERNET OF THINGS L T P C
3 0 0 3

COURSE Objectives:
- To Understand the basis for intersection of IOT and Edge Analytics
- To Understand the IOT protocols and standards
- To comprehend the use of Machine Learning in Edge Analytics
- To gain understanding on the use of Deep Learning techniques for analytics
- To gain insight into edge analytics models and deployment

UNIT I INTRODUCTION TO IOT
Importance and Need for IoT - Application and Use cases of IoT - Overview of Industrial IoT - Intersection of IoT and Edge Analytics.

UNIT II IOT PROTOCOLS AND SYSTEMS
IoT protocols and standards - Cloud IoT Infrastructure - Setup and program IoT device - Data Collection from IoT device.

UNIT III MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE
Introduction to Machine Learning and Artificial Intelligence - Overview of Deep Learning and Neural Networks - Introduction to Convolution Neural Networks.

UNIT IV AUTO ENCODERS AND ITS PROGRAMMING
Introduction to Recurrent Neural Networks - Introduction to Auto Encoders - Programming Practice: Build Image Classifier, Build Anomaly Detector

UNIT V EDGE ANALYTICS
Challenges with Edge Devices and Deployment - Need for Model Quantization - Quantization Aware Training - Post Model Quantization - Programming Practice: Model quantization, Deploying model on Edge Devices

TOTAL: 45 PERIODS
COURSE OUTCOMES:
Upon completion of this course, student will be able to
CO 1: Use the foundational concepts in Edge Analytics for application design and development
CO 2: Use IOT protocols in cloud environments.
CO 3: Implement and use Machine Learning and Artificial Intelligence algorithms and tools
CO 4: implement and use Deep Learning techniques for applications
CO 5: Analyze Edge devices analytics models and and its challenges

REFERENCES:

VL4072 CAD FOR VLSI DESIGN L T P C 3 0 0 3

COURSE OBJECTIVES:
• to introduce the VLSI design methodologies and design methods.
• to introduce data structures and algorithms required for VLSI design.
• to study algorithms for partitioning and placement.
• to study algorithms for floor planning and routing.
• to study algorithms for modelling, simulation and synthesis.

UNIT I INTRODUCTION 9

UNIT II DATA STRUCTURES AND BASIC ALGORITHMS 9

UNIT III ALGORITHMS FOR PARTITIONING AND PLACEMENT 9

UNIT IV ALGORITHMS FOR FLOORPLANNING AND ROUTING 9

UNIT V MODELLING, SIMULATION AND SYNTHESIS 9

TOTAL:45 PERIODS
COURSE OUTCOMES:
At the end of this course, the students should be able to:

**CO1:** use various VLSI design methodologies
**CO2:** understand different data structures and algorithms required for VLSI design.
**CO3:** develop algorithms for partitioning and placement.
**CO4:** develop algorithms for floorplanning and routing.
**CO5:** design algorithms for modelling, simulation and synthesis.

REFERENCES

AP4072 PCB DESIGN L T P C
3 2 0 4

COURSE OBJECTIVES:
- Understand the need for PCB Design and steps involved in PCB Design and Fabrication process.
- Familiarize Schematic and layout design flow using Electronic Design Automation (EDA) Tools.
- Understand basic concepts of transmission line, crosstalk and thermal issues
- Design (schematic and layout) PCB for analog circuits, digital circuits and mixed circuits.
- Schematic creation & interpretation

UNIT I INTRODUCTION TO PRINTED CIRCUIT BOARD
Introduction to Printed circuit board: fundamental of electronic components, basic electronic circuits, Basics of printed circuit board designing: Layout planning, general rules and parameters, ground conductor considerations, thermal issues, check and inspection of artwork.

UNIT II DESIGN RULES FOR PCB
Design rules for PCB: Design rules for Digital circuit PCBs, Analog circuit PCBs, high frequency and fast pulse applications, Power electronic applications, Microwave applications, PCB Technology Trends: Multilayer PCBs. Multiwire PCB, Flexible PCBs, Surface mount PCBs, Reflow soldering, Introduction to High-Density Interconnection (HDI) Technology.

UNIT III INTRODUCTION TO ELECTRONIC DESIGN AUTOMATION(EDA) TOOLS FOR PCB DESIGNING
Introduction to Electronic design automation(EDA) tools for PCB designing: Brief Introduction of various simulators,SPICE and PSPICE Environment, Selecting the Components
Footprints as per design, Making New Footprints, Assigning Footprint to components, Net listing, PCB Layout Designing, Auto routing and manual routing. Assigning specific text (silkscreen) to design, Creating report of design, creating manufacturing data (GERBER) for design.

UNIT IV INTRODUCTION PRINTED CIRCUIT BOARD PRODUCTION TECHNIQUES

Introduction printed circuit board production techniques: Photo printing, film-master production, reprographic camera, basic process for double sided PCBs photo resists, Screen printing process, plating, relative performance and quality control, Etching machines, Solders alloys, fluxes, soldering techniques, Mechanical operations

UNIT V PCB DESIGN FOR EMI/EMC

PCB design for EMI/EMC: Subsystem/PCB Placement in an enclosure, Filtering circuit placement, decoupling and bypassing, Electronic discharge protection, Electronic waste; Printed circuit boards Recycling techniques, Introduction to Integrated Circuit Packaging and footprints, NEMA and IPC standards.

SUGGESTED ACTIVITIES:

1. Using any Electronic design automation (EDA) software, Practice following PCB Design steps (Open source EDA Tool KiCad Preferable or equivalent ) Example circuit: Basic RC Circuit Schematic Design: Familiarization of the Schematic Editor, Schematic creation, Annotation, Netlist generation Layout Design: Familiarization of Footprint Editor, Mapping of components, Creation of PCB layout Schematic Create new schematic components Create new component footprints.

2. Fabricate single-sided PCB, mount the components and assemble in a cabinet for any one of the circuits mentioned below.

4. Astable or Monostable multivibrator using IC555
5. RC Phase-shift or Wein-bridge Oscillator using transistor.
6. 4 bit binary /MOD N counter using D-Flip flops.
7. Design a 8051 Development board having Power section consisting of IC7805, capacitor, resistor, headers, LED,Serial communication section consisting of MAX 232, Capacitors,DB9 connector, Jumper, LEDs, Reset & Input/ output sections consisting of89C51 Microcontroller, Electrolytic Capacitor, Resistor, Jumper, Crystal Oscillator, Capacitors.
8. Touch plate switches – transistorized or 555 based
9. Doorbell/cordless bell
10. Clapping switch and IR switch
11. Blinkers
12. Cell charger, battery charger, mobile charger
13. Fire/smoke/intruder alarm
14. Liquid level controller
15. Audio amplifiers

COURSE OUTCOMES:
Upon the completion of this course, students will demonstrate the ability to:
CO1: Appreciate the necessity and evolution of PCB, types and classes of PCB.
CO2: Understand the steps involved in schematic, layout, fabrication and assembly process of
PCB design.

CO3: Apply advanced techniques, skills and modern tools for designing and fabrication of PCBs.

CO4: Apply the knowledge and techniques to fabricate Multilayer, SMT and HDI PCB.

CO5: Design (schematic and layout) and fabricate PCB for simple circuits.

TOTAL: 45 + 30 = 75 PERIODS

REFERENCES

1. Printed circuit board design, fabrication assembly and testing By R. S. Khandpur, Tata McGraw Hill 2006


5. EMC and Printed circuit board, Design theory and layout, Mark I Montrose IEEE compatibility society


10. PCB Fabrication at home (video): https://www.youtube.com/watch?v=mv7Y0A9YeUc, https://www.youtube.com/watch?v=imQTCW1yWkg

DS4151 DIGITAL IMAGE AND VIDEO PROCESSING L T P C
3 0 2 4

COURSE OBJECTIVES:

- To provide the student with basic understanding of image fundamentals and transforms
- To provide exposure to the students about image enhancement and restoration
- To impart a thorough understanding about segmentation and Recognition.
- To know the Video Processing and motion estimation
- Learning the concepts will enable students to design and develop an image processing application.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING AND TRANSFORMS

Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Need for transform, image transforms, Fourier transform, 2D Discrete Fourier transform, Walsh transform, Hadamard transform, Haar transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms. Digital Camera working principle.
UNIT II  ENHANCEMENT AND RESTORATION  

UNIT III  SEGMENTATION AND RECOGNITION  

UNIT IV  BASIC STEPS OF VIDEO PROCESSING  
Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Videosignals, Filtering operations

UNIT V  2-D MOTION ESTIMATION  
Optical flow, optical flow constraints, 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.

45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Histogram Equalization
2. Image Filtering (spatial-domain)
3. Image Filtering (frequency-domain)
4. Image Segmentation
5. Familiarization with Video Processing tools
6. Denoising video
7. Video resizing
8. Background subtraction
9. Interpolation methods for re-sampling
10. Adaptive unsharp masking based interpolation for video up-sampling
11. Gaussian mixture model (GMM) based background subtraction
12. Video encoding

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1: Analyze the digital image, representation of digital image and digital images in transform Domain.

CO2: Analyze the detection of point, line and edges in images and understand the redundancy in images, various image compression techniques.

CO3: Analyze the video technology from analog color TV systems to digital video systems, how video signal is sampled and filtering operations in video processing.
CO4: Obtain knowledge in general methodologies for 2D motion estimation, various coding used in video processing.

CO5: Design image and video processing systems.

TOTAL: 75 PERIODS

REFERENCES:

CP4252 MACHINE LEARNING

UNIT I INTRODUCTION AND MATHEMATICAL FOUNDATIONS

UNIT II SUPERVISED LEARNING

UNIT III UNSUPERVISED LEARNING AND REINFORCEMENT LEARNING

UNIT IV PROBABILISTIC METHODS FOR LEARNING
UNIT V  NEURAL NETWORKS AND DEEP LEARNING

Neural Networks – Biological Motivation- Perceptron – Multi-layer Perceptron – Feed Forward Network – Back Propagation-Activation and Loss Functions- Limitations of Machine Learning – Deep Learning– Convolution Neural Networks – Recurrent Neural Networks – Use cases

SUGGESTED ACTIVITIES:

1. Give an example from our daily life for each type of machine learning problem
2. Study at least 3 Tools available for Machine Learning and discuss pros & cons of each
3. Take an example of a classification problem. Draw different decision trees for the example and explain the pros and cons of each decision variable at each level of the tree
4. Outline 10 machine learning applications in healthcare
5. Give 5 examples where sequential models are suitable.
6. Give at least 5 recent applications of CNN

PRACTICAL EXERCISES:

1. Implement a Linear Regression with a Real Dataset (https://www.kaggle.com/harrywang/housing). Experiment with different features in building a model. Tune the model's hyperparameters.
2. Implement a binary classification model. That is, answers a binary question such as "Are houses in this neighborhood above a certain price?"(use data from exercise 1). Modify the classification threshold and determine how that modification influences the model. Experiment with different classification metrics to determine your model's effectiveness.
3. Classification with Nearest Neighbours. In this question, you will use the scikit-learn's KNN classifier to classify real vs. fake news headlines. The aim of this question is for you to read the scikit-learn API and get comfortable with training/validation splits. Use California Housing Dataset
4. In this exercise, you'll experiment with validation sets and test sets using the dataset. Split a training set into a smaller training set and a validation set. Analyze deltas between training set and validation set results. Test the trained model with a test set to determine whether your trained model is overfitting. Detect and fix a common training problem.
5. Implement the k-means algorithm using https://archive.ics.uci.edu/ml/datasets/Codon+usage dataset
6. Implement the Naïve Bayes Classifier using https://archive.ics.uci.edu/ml/datasets/Gait+Classification dataset
7. Project - (in Pairs) Your project must implement one or more machine learning algorithms and apply them to some data.
   a. Your project may be a comparison of several existing algorithms, or it may propose a new algorithm in which case you still must compare it to at least one other approach.
   b. You can either pick a project of your own design, or you can choose from the set of pre-defined projects.
   c. You are free to use any third-party ideas or code that you wish as long as it is publicly available.
   d. You must properly provide references to any work that is not your own in the write-up.
   e. Project proposal You must turn in a brief project proposal. Your project proposal should describe the idea behind your project. You should also briefly describe software you will need to write, and papers (2-3) you plan to read.

List of Projects (datasets available)

1. Sentiment Analysis of Product Reviews
2. Stock Prediction

45 PERIODS

30 PERIODS
3. Sales Forecasting
4. Music Recommendation
5. Handwriting Digit Classification
6. Fake News Detection
7. Sports Prediction
8. Object Detection
9. Disease Prediction

COURSE OUTCOMES:
Upon the completion of course, students will be able to
CO1: Understand and outline problems for each type of machine learning
CO2: Design a Decision tree and Random forest for an application
CO3: Implement Probabilistic Discriminative and Generative algorithms for an application and analyze the results.
CO4: Use a tool to implement typical Clustering algorithms for different types of applications.
CO5: Design and implement an HMM for a Sequence Model type of application and identify applications suitable for different types of Machine Learning with suitable justification.

TOTAL: 75 PERIODS

REFERENCES

UNIT II SINGLE AND MULTIPLE SAMPLE DETECTION
Hypothesis Testing and the MAP Criterion, Bayes Criterion, Minimax Criterion, Neyman-Pearson Criterion, Sequential Detection, The Optimum Digital Detector in Additive Gaussian Noise , Performance of Binary Receivers in AWGN.

UNIT III FUNDAMENTALS OF ESTIMATION THEORY

UNIT IV WIENER AND KALMAN FILTERS

UNIT V APPLICATIONS
Detector Structures in Non-Gaussian Noise , Examples of Noise Models, Receiver Structures, and Error-Rate Performance, Estimation of Non-Gaussian Noise Parameters Fading Multipath Channel Models, Receiver Structures with Known Channel Parameters, Receiver Structures without Knowledge of Phase, Receiver Structures without Knowledge of Amplitude or Phase, Receiver Structures and Performance with No Channel Knowledge.

PRACTICALS: PERIOD – 30 HRS
Software Requirement: Matlab / Python / Equivalent
1. Power Spectrum Estimation of a Random Signal
2. Maximum Likelihood Estimation
3. Design of optimum receiver in AWGN channel
4. Wiener Filter Design
5. Adaptive Filter Design using LMS algorithm
6. Minimum Variance Estimation

COURSE OUTCOMES:
Upon completion of the course the student will be
CO1: Able to understand the importance of probability and stochastic process concepts in detection and estimation.
CO2: Able to design optimum detector and estimator for AWGN channel
CO3: Able to design and analyze the various estimators.
CO4: Able to design Wiener and Kalman filters to solve linear estimation problems.
CO5: Able to design and develop novel receiver structures suitable for modern technology.

REFERENCES
1. Harry L. Van Trees, "Detection, Estimation and Modulation Theory", Part I John Wiley and

AUDIT COURSES

AX4091 ENGLISH FOR RESEARCH PAPER WRITING L T P C
2 0 0 0

COURSE OBJECTIVES:
- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING 6
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS 6

UNIT III TITLE WRITING SKILLS 6
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS 6
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS 6
Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first-time submission

TOTAL: 30 PERIODS

COURSE OUTCOMES:
CO1 : Understand that how to improve your writing skills and level of readability
CO2 : Learn about what to write in each section
CO3 : Understand the skills needed when writing a Title
CO4 : Understand the skills needed when writing the Conclusion
CO5 : Ensure the good quality of paper at very first-time submission
REFERENCES:

AX4092 DISASTER MANAGEMENT L T P C
2 0 0 0

COURSE OBJECTIVES:
- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION 6
Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS 6

UNIT III DISASTER PRONE AREAS IN INDIA 6
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

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT 6
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.

UNIT V RISK ASSESSMENT 6
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

TOTAL: 30 PERIODS

COURSE OUTCOMES:
CO1: Ability to summarize basics of disaster
CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO5: Ability to develop the strengths and weaknesses of disaster management approaches.

REFERENCES:


AX4093 CONSTITUTION OF INDIA

COURSE OBJECTIVES:
Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- 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 nationhood in the early years of Indian nationalism.
- 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.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION
History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION
Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES

UNIT IV 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.

UNIT V LOCAL ADMINISTRATION
District’s Administration head: Role and Importance, Municipalities: Introduction, Mayor and role

UNIT VI ELECTION COMMISSION
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- 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.
- Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING
1. The Constitution of India,1950(Bare Act),Government Publication.
UNIT III

தூய்கமகய வலியுறுத்தும் நூல்

1. கணகியின் புரட்சி
   - சிற்பபக்கொருக்குதற்கு தமிழ்
2. மூகப்பக்கி மணிப்பங்கள்
   - குறைக்கும் அகநூறும் காலம்

UNIT IV

அதாந்தியக் கிளியே

1. சிற்பபக்கொருக்கும்
   - பாரி புனர்கொத்து வியா வருகீகளுக்கு களாத்திகளால் இருந்து வளர்ந்திருக்கும் சிற்பபக்கி
2. குறைக்கும்
   - குறைக்கும் பல்கவலன்
3. நூற்றையாகம் (617, 618)
   - இலக்கியம் தினம் விஞ்சிகள்
4. குறைக்கும் பல்கவலன் தினமில் வருமாறாக
5. பரமாறாக
   - குறைக்கும் வருமாறாக
6. குறைக்கும் (4)
   - குறைக்கும்
   - குறைக்கும் (11)
   - குறைக்கும் (11)
   - வருமாறாக-பொருள்
   - வருமாறாக-பொருள் 50 (27)

UNIT V

நவீன தமிழ் இலக்கியம்

1. உகரநகடத் தமிழ்
   - வெளிட்டுப்பகுதிகள்
   - வெளிட்டுப்பகுதிகள்
   - வெளிட்டுப்பகுதிகள்
   - வெளிட்டுப்பகுதிகள்
   - வெளிட்டுப்பகுதிகள்
2. நொட்டு விடுதியாகவும் தமிழ் இலக்கியமும்
3. முதொய விடுதியாகவும் தமிழ் இலக்கியமும்
4. தபண் விடுதியாகவும் விளிம்பு விளிம்பு விளிம்பினரின் பமாறில் தமிழ் இலக்கியமும்
5. அதிகியல் தமிழ்
6. இகணயத்தில் தமிழ்
7. சுற்றுசூழல் பமாறில் தமிழ் இலக்கியம்

TOTAL: 30 PERIODS
தமிழ் துறையின் தொலைபிள்ளை / புத்தகக்கள்

1. தமிழ் விடத்தாடு தொலைக்குடும்ப (Tamil Virtual University) - www.tamilvu.org
2. தமிழ் விக்கிப்பீடியொ (Tamil Wikipedia) - https://ta.wikipedia.org
3. தர்மபுர ஆத்தேசா இலங்கை
4. வேலுகளின் கல்தொழில
   - தமிழ் பாலகலக்கழகம், தஞ்சாவூர்
5. தமிழகத்தில் கல்தொழில
   - தமிழ் வலக்பரிசை துறை (thamilvalarchithurai.com)
6. அறிவியல் கல்தொழில
   - தமிழ் பல்கரைக்கழகம், தஞ்சாவூர்