## First Semester

<table>
<thead>
<tr>
<th>Sub. No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEC-101</td>
<td>Modern Digital Communication Techniques</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MEC-102</td>
<td>Information Theory and Coding</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MEC-103</td>
<td>VLSI Design</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MEC-104</td>
<td>Telecommunication Switching &amp; Networks</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MEC-191</td>
<td>Telecommunication System Engineering Lab.-I</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>MEC-192</td>
<td>Design and Simulation Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>MEC-193</td>
<td>Seminar-I</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>MEC-194</td>
<td>Comprehensive Viva Voce-I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total = 15 5 9 28

## Second Semester

<table>
<thead>
<tr>
<th>Sub. No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEC-105</td>
<td>Mobile communication</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MEC-106</td>
<td>Data Security &amp; Cryptography</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MEC-107</td>
<td>Optical &amp; Satellite Communication Systems</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MEC-195</td>
<td>Telecommunication System Engineering Lab.-II</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>MEC-196</td>
<td>Wireless &amp; Fiber optics Communication Lab.</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>MEC-197</td>
<td>Seminar-II</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>MEC-198</td>
<td>Comprehensive Viva Voce-II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total = 15 5 9 28

## Third Semester

<table>
<thead>
<tr>
<th>Sub. No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEC-291</td>
<td>Dissertation Interim Evaluation</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>MEC-292</td>
<td>Comprehensive Viva -Voce</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>MEC-293</td>
<td>Seminar on Dissertation</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Total = 15

## Fourth Semester

<table>
<thead>
<tr>
<th>Sub no</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEC-294</td>
<td>Dissertation Open Defense</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>MEC-295</td>
<td>Dissertation Final Evaluation</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

Total = 25

**Grand Total = 96**

### Group-I (In first semester)
- MEC-108 Advanced Digital signal Processing
- MEC-109 Advanced Electromagnetic fields
- MEC-110 Advanced Microprocessors

### Group-II (In second semester)
- MEC-111 Fiber Optics Devices & Components
- MEC-112 Computational Intelligence
- MEC-113 Internet Technology

### Group-III (In second semester)
- MEC-114 Adaptive Signal Processing
- MEC-115 Digital Image Processing
- MEC-116 Embedded system
Formatting And Modulation of Baseband
Baseband Systems, Formatting Textual Data (Character Coding), Messages, Characters, and Symbol, Formatting Analog Information, Sources of Corruption, Pulse Code Modulation, Uniform and Nonuniform Quantization, Baseband Modulation, Correlative Coding

Baseband Demodulation/ Detection
Signals and Noise, Detection of Binary Signals in Gaussian Noise, Intersymbol Interference, Equalization

Bandpass Modulation And Demodulation / Detection
Digital Bandpass Modulation Techniques, Detection of Signals in Gaussian Noise, Coherent Detection, Noncoherent Detection, Complex Envelope, Error Performance for Binary Systems, M-ary Signaling and Performance, Symbol Error Performance for M-ary Systems

Communications Link Analysis
Received Signal :Power and Noise Power, Link Budget Analysis, Noise Figure, Noise Temperature, and System Temperature, Sample Link Analysis , Satellite Repeaters

Synchronization:
Introduction, Receiver Synchronization, Network Synchronization

Multiplexing And Multiple Access:
Allocation of the Communications Resources, Multiple Access, Communications System and Architecture, Access Algorithms, Multiple Access Techniques Employed with INTELSAT, Multiple Access Techniques for Local Area Network

Spread Spectrum Techniques:

Fading Channels:
The Challenge of Communicating over Fading Channels, Characterizing, Mobile-Radio Propagation, Signal Time-Spreading, Time Variance of the Channel Caused by Motion Mitigating the Degradation Effects of Fading, Summary of the Key Parameters Characterizing Fading Channels, Applications: Mitigating the Effects of Frequency Selective Fading

Text Book:

Reference:
(2) Principles of Communications, Taub and Scheling, TMH Publication.

MEC-102: INFORMATION THEORY AND CODING : (3-1-0) Credit: 4

Channel Coding: Part 1
Waveform Coding and Structured Sequences, Types of Error Control, Structured Sequences, Linear Block Codes, Error Detecting and Correcting Capability, Usefulness of the Standard Array, Cyclic Code, Well Known Block Codes

**Channel Coding: Part 2**

Convolutional Encoding, Convolutional Encoder Representation, Formulation of the Convolutional Decoding Problem, Properties of Convolutional Codes, Other Convolutional Decoding Algorithms

**Channel Coding: Part 3**

Reed Solomon Codes, Interleaving and Concatenated Codes, Coding and Interleaving Applied to the Compact Disc, Digital Audio Systems, Turbo Codes.

**Modulation And Coding Trade Offs:**


**Source Coding:**


**Text Book:**


**References:**

(1) Information Theory, coding and Cryptography by Ranjan Bose, TMH Publication.

**MEC-103: VLSI DESIGN : (3-1-0) Credit: 4**

**Unit-I:**

**Unit-II: Front End Design:**
Introduction to high level Design, Hardware description language.

VHDL: Introduction, Behavioral Modeling, sequential processing, Data types, Sub program & Packages, Attributes, Configurations.

High level Design flow
Synthesis tools: Synopsis.
Unit-III Backend Design:
Introduction to low level Design.
MOS Structure: Band Diagram, NMOS, PMOS, CMOS digital logic gates Inverters.
Digital Design: Static Logic, Switch logic & dynamic logic design styles.

Introduction to SPICE(T-Spice) for circuit simulation VLSI Technology.

Unit-IV: Fabrication Process (NMOS & CMOS):
Wafer Preparation, Oxidation, Photo & Ion Lithography, Etching, Diffusion, Ion implementation, Metallization.

Unit-V: Layout Design:
Stick diagram and layout of digital circuit, introduction to Layout generation tools. (VLSI Software: Tanner L-Edit), CiF & GDS-II formats.

Unit-VI: Design of Telecom Chips:
Introduction To VLSI Design of modulators, Demodulators, Trans-receiver ICs, Coder & Decoders, Companies involved in communication chip design.

Text Books:
1. Application specific integrated Circuits by smith (for UNIT:I)
2. VHDL by Douglas Perry, TMH Publication (for UNIT-II)
3. VLSI Design & Techniques, puknell & Eshraghian, PHI,(for UNIT-III and UNIT-V)
4. VLSI Technology S. M. Sze, McGraw Hill(for UNIT-IV)
5. Resource from internet: www.ti.com

MEC-104: Telecommunication Switching And Networks: (3-1-0) Credit : 4

Introduction:
Evolution, simple telephone communication, basics of switching systems, telecommunication networks.

Electronic space division switching:
Stored program control, centralized and distributed SPC, software architecture, application software, enhanced software, two and three stage networks.

Time Division Switching:
Basic time division space switching, basic time division time switching, time multiplexed space and time switching, combination switching, three-stage combination switching.

Traffic Engineering:
Network traffic load and parameters, Grade of service, modeling switching systems, incoming traffic, blocking models and loss estimates.

Telephone Networks:
Subscriber loop systems, switching hierarchy and routing, transmission plan, transmission systems, signaling techniques.

Data Networks:
Data transmission in PSTN, switching techniques, Data communication architecture, link-to-link layers, end-to-end layers, satellite based data networks, LAN, MAN, Fiber optic networks, an overview of data network standards.
Integrated Service Digital Network, motivation, new services, transmission channels, signaling, service characterization, ISDN standards, broadband ISDN, voice data integration.

Text Books:
1. Telecommunication Switching Systems and Networks by Thiagarajan Viswanathan, PHI.

Reference Books:
2. Communication Networks by Leon Gracia and Widjaja, TMH.

MEC-108: ADVANCED DIGITAL SIGNAL PROCESSING : (3-1-0) Credit: 4

Unit-I: Multirate Digital Signal Processing:

Unit-II: Linear prediction and Optimum Linear Filters:

Unit-III: Power Spectrum Estimation:

Unit-IV: Higher Order Statics(HOS):
Moments, Cumulants, Blind Parameters and Order estimation of MA & ARMA systems- Application of Higher Order Statistics

Unit-V:
Filter Bank and Subband Filters and its applications

Unit-VI: Adaptive Signal Processing:

Text Books:
2. Adaptive Signal Processing, B. Widrow and Stern

MEC-109: ADVANCED ELECTROMAGNETIC FIELDS : (3-1-0) Credit: 4

Unit-I: Electrostatic Fields:
Coulomb’s Law, Electric field Intensity, Gauss’s law, Green’s function, Electrostatic Potential, Conductor and Dielectrics, Boundary conditions, Poisson’s & Laplace’s Equation, Uniqueness of solution, Method of Images, Electrostatic Forces.

**Unit-II: Magnetostatic Fields:**
Charges in motion, Ampere’s law, Magnetic Flux Density, Biot-Savart law & Lorentz force equation, Magnetostatic potential and flux, Magnetic Materials, Boundary condition, Magnetostatic Circuit parameters, Magnetostatic stored energy, Magnetic circuits.

**Unit-III: Maxwell’s Equation:**
Faraday’s law, Gauss’s law, Conservation of charge, Ampere’s law, Constitutive properties of the medium, Boundary condition, power flow and pointing vector, sinusoidal steady state.

**Unit-IV: Propagation plane Waves:**
The wave equation, Uniform plane waves, conductors & Dielectrics, skin depth, polarization of Uniform plane waves, Group velocity, Normal incidence of Uniform Plane waves on Plane Boundaries, Oblique incidence of Uniform plane waves on plane waves on plane boundaries and loss less media

**Unit-V: Wave Guides:**
Parallel wave guides, Rectangular wave guides, Cavity resonator, Dielectric wave guides

**Unit-VI: Antenna:**
Elemental Dipole Antenna array, Antenna Directivity and gain, Antenna Coupling, Different advanced antenna structures.

**Unit-VII: Bioelectromagnetics:**

**Text Books:**
3. Electromagnetics with Applications, 5th edition, Kraus/ Fleosfc, Mc Graww Hill Publication (for Unit-III)

**MEC-110: ADVANCED MICROPROCESSORS: (3-1-0) Credit: 4**

**Unit-I: Intel 8086 Microprocessor:**

**Unit-II : Intel 80286 Microprocessor:**

**Unit-III: 80386 Microprocessor-80387 Math Coprocessor and 80486:**
Salient features of 80386, Architecture, Pin description, Register organization, Addressing modes, Data types, Real address modes of 80386, segmentation, paging,
virtual 80386 modes, The co-processor 80387, The CPU with a Numeric Coprocessor-80486.

**Unit-IV: Pentium Processor:**
- Salient features of 80586(Pentium), Architecture, instruction set, Pentium:II

**Unit-V:**
- Assembler, DOS, Basic I/O system, Mouse and DPMI Memory Manager using MASM, TASM, DEBUG, link a program

**Text Book:**
1. Intel 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium processor 5/e
2. Architecture, programming and Interfacing, Bary B Brey, Pearson Education

**MEC-191: Telecommunication System Engineering Laboratory-I: (0-0-3) credit: 2**
1. Simulation of White Uniform noise, Gaussian Noise, Colored noise
2. Simulation of Tap Delay Digital Filters
3. Simulation of Adaptive Filters (LMS based)
5. Simulation of data Compression using DCT
6. Simulation of PCM and TDM
7. Simulation of PSK and DPSK Signal

**MEC-192: Design and Simulation Laboratory: (0-0-3) credit: 2**
1. Simulation of various codes
2. Simulation of Adaptive System Identification (All zero types)
3. Simulation of Adaptive Filtering of sine wave extraction from mixed harmonics and…..)
4. SPICE Simulation of inverters(N-MOS, P-MOS and C-MOS)
5. SPICE Simulation of Digital Systems (Static, Switch logic and dynamic types)
6. VHDL Simulation of Digital Circuits (Multiplexer, ALU and n-bit adder)

**MEC-105: MOBILE COMMUNICATION: (3-1-0) Credit: 4**

**Introduction:**
Evolution, Mobile radio standards, examples: paging systems, cordless telephone systems, cellular telephone systems, comparison of common wireless communication systems, Third generation wire less networks.

**The Cellular System Design:**
Introduction, frequency reuse, channel assignment, Hand off mechanism, interface and system capacity, trunking and grade of service, cell splitting, sectoring, repeaters.

Cell site antennas, mobile antennas Data links, available frequencies, link design and diversity requirement.

**Mobile Radio Propagation:**
(a) Large-scale path loss:
Outdoor propagation model
   (i) O Kumura Model  (ii) Hata Model
Indoor propagation model: Attenuation factor model
(b) Small scale fading and multi path:
   Small scale multi path propagation, parameters of mobile multi path channels, Fading effects due to multi path time delay spread and due to Doppler spread, Clark and Gans fading model.

Modulation Techniques for Mobile Radio:
QPSK, Constant envelope modulation, MFSK, OFDM, DS and FH spread spectrum techniques.

Frequency Management and channel Assignment:
Frequency management set up channels, channel assignment and algorithms, traffic and channel assignment.

Equalization, Diversity and Channel Coding:
Fundamentals of equalization, training, linear and non linear equalizers, LMS and Zero forcing algorithms, diversity techniques, RAKE receivers, fundamental of channel coding, Reed-Solomon codes, Turbo and Trellis codes.

Multiple Access Techniques:
FDMA, TDMA FHMA, CDMA and SDMA, capacity of CDMA and SDMA.

Reference Books:

MEC-106: DATA SECURITY AND CRYPTOGRAPHY : (3-1-0) Credit: 4

Introduction To The Concepts Of Security

Cryptographic Techniques:
Introduction, Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks.

Computer Based Symmetric Key Cryptographic Algorithms:
   Introduction, Algorithm Types and modes, An Overview of Symmetric Key Cryptography, Data Encryption Standard (DES), International Data Encryption Algorithm (DEA), RC5, Blowfish, Advanced Encryption, Standard (AES), Differential and Linear Cryptanalysis.

Computer Based Asymmetric Key Cryptographic Algorithms:
   Introduction, Brief history of Asymmetric Key Cryptography, An Overview of Asymmetric Key Cryptography, the RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signatures, Knapsack Algorithm, Some other Algorithms.

Public Key Infrastructure :
   Introduction, Digital Certificates ,Private Key Management, the PKIX, Public Key Cryptography Standards (PKCS) XML, PKI and Security.

Internet Security Protocols:
Basic Concepts, Secure Socket Layer (SSL), Secure Hyper Text Transfer Protocols (SHTTP), Time, Stamping Protocol (TSP), Secure Electronic Transaction (SET), SSL versus SET, 3-D Secure Protocol, Electronic money Email Security, Wireless Application Protocol (WAP), Security in GSM.

**User Authentication Mechanisms:**

**Practical Implementations Of Cryptography/Security:**

**Network Security:**
Brief Introduction to TCP/IP, Firewalls, IP Security, Virtual Private Networks (VPN)

**Text Book:**
(1) Cryptography and Network Security by A. Kahate, PHI Publication

**MEC-107: Optical & Satellite Communication System:** (3-1-0) Credit : 4

**A) OPTICAL FIBER COMMUNICATIONS**

**Digital Transmission Systems:-**
Point – to – point Links

**Analog Systems:-**
Overview of Analog Links, Carrier-to-Noise Ratio, Multichannel Transmission Techniques

**WDM Concepts and components:-**
Operational Principles of WDM, Passive Components, Tunable Sources, Tunable filters

**Optical Amplifiers:-**

**Optical Networks:-**

**B) SATELLITE COMMUNICATIONS**

**Orbital Mechanics and Launchers:-**
Orbital Mechanics, Look Angle Determination, Orbital Perturbations, Orbit Determination, Launches and Launch Vehicles, Orbital Effects in Communications systems Performance

**Satellite Link Design:-**

**Propagation Effects and their Impact on Satellite-Earth Links:-**
Quantifying Attenuation and Depolarization, Propagation Effects that Are Not associated with Hydrometeors, Rain and Ice Effects,

**VSAT System:-**
Overview of VSAT Systems, Network Architectures, Access Control Protocols, Basic Techniques, VSAT Earth Station Engineering

**Low Earth Orbit and Non-Geostationary Satellite Systems:-**
Orbit Considerations, Coverage and Frequency Considerations, Delay and Throughput Considerations, System Considerations
Text Books:

MEC-111: FIBER-OPTIC DEVICES AND COMPONENTS: (3-1-0) Credit : 4

Fiber-Optic Light Sources:

Fiber-Optic Detectors:
Physical principles of photodiodes, PIN photo detector, Avalanche photodiodes, Photodetector noise, Noise sources, Signal-to-Noise ratio, Detector response time, Depletion layer photocurrent, Response time, Avalanche multiplication noise, Temperature effect on avalanche gain.

Optical Fibre Connection:
Joint loss, Multi mode fibre joints, Singe mode fibre joints, Fibre splices, Fusion splices, Mechanical splices, Multiple splices, Fibre connectors, Cylindrical ferrule connectors, Biconical ferrule connections, Double eccentric connectors, Duplex fibre connectors, Expanded beam connectors, Fibre couplers, Three port couplers, Four port couplers, Start couplers, WOM couplers.

Optical Amplification and Integrated Optics:

Reference Books:
2. Optical Fiber Communications Principles and Practice, - J.M.Senior, PHI

MEC-112: COMPUTATIONAL INTELLIGENCE: (3-1-0) Credit : 4

Introduction to Soft Computing:
Soft computing constituents and conventional Artificial Intelligence, Neuro-Fuzzy and Soft Computing characteristics.

Fuzzy Sets, Fuzzy Rules and Fuzzy Reasoning:

Fuzzy Interference System:
Mamdani fuzzy models, Sugeno fuzzy models, Tsukamoto fuzzy models, Other considerations.

Least Square Method for System Identification:
System Identification, Basic of matrix manipulations and calculus, Least-square estimator, Geometric interpretation of
LSE, Recursive least-square estimator, Recursive LSE for time varying systems, Statistical properties and maximum likelihood estimator, LSE for nonlinear models.

**Derivative based Optimization:** Descent methods, Method of Steepest Descent, Newton’s method, Step size determination, Conjugate gradient methods, Analysis of quadratic case, Nonlinear least-square problems, Incorporation of stochastic mechanism.

**Derivative-free Optimization:**
Genetic algorithm simulated annealing, Random search, Downhill simplex search.

**Adaptive Networks:** Architecture, Back propagation for feed forward networks, Extended back propagation for recurrent networks, Hybrid learning rule: combining steepest descent and LSE.

**Supervised Learning Neural Networks:** Perceptrons, Adaline, Back propagation multi layer perceptrons, Radial basis function networks.

**Learning from Reinforcement:** Failure is the surest path to success, Temporal difference learning, The art of dynamic programming, Adaptive heuristic critic, Q-learning, A cost path problem, World modeling, Other network configurations, Reinforcement learning by evolutionary computations.

**Unsupervised Learning and other Neural Networks:** Competitive learning networks, Kohonen self-organizing networks, Learning vector quantization, Hebbian learning, Principal component networks, Hopfield network.

**Adaptive Neuro-Fuzzy Inference Systems:** ANFIS architecture, Hybrid learning algorithms, Learning methods that cross-fertilize ANFIS and RBNF, ANFIS as universal approximator, Simulation examples, Extensions and advance topics.


**Reference Books:**

**MEC-113: INTERNET TECHNOLOGY: (3-1-0) Credit : 4**

**TCP/ IP:**
TCP/IP Overview, TCP/IP and Internet, Layers of TCP/IP, Network Layer: Addressing, Subnetting, concepts of ARP, RARP, ICMP, IGMP. Transport Layer: UDP & TCP, Application Layer: Client server model, BOOTP, DHCP, DNS, TELNET, FTP, SMTP model, HTTP, idea of WWW and CGI.

**Web Design:**
HTML and Tags, Image, color and background, Image map, style sheet, table, frame, creating hyperlinks and anchors, text formatting tags, Designing forms and controls, DHTML, DHTML object model.

**Java Script and XML:**
Java script, programming overview, detailed of language, server side and client side scripting, example of simple email program, Introduction to XML, XML document syntax, document type definition, example XML technology.

**Core JAVA:**
JAVA fundamentals, overview of JAVA operators, control statements, introducing classes, inheritance, exception handling, AWT, working with window graphics and text, AWT controls, Layout manager.

**Advanced JAVA:**
Introducing threading, advantages, Multi-threading, JAVA and networking, TCP / IP client sockets, Whois, URL, Server sockets, Overview of a caching Proxy HTTP server.

**Applets and JDBC:**
Introducing Applets, Architecture of an applet, skeleton, HTML APPLET tag, Event Handling, JDBC, Connecting to a database, transactions and executing SQL query, JDBC interface, Callable and prepared statements, Introducing to swing.

**Network Security:**
Network security basics and needs, cryptography, encryption and decryption, Ciphertext, types of cryptography symmetric and asymmetric, RSA algorithm, Digital Signature, Organizational security issues and firewall architecture.

**Reference Books:**
1. Data communication and Networking, - Forouzan.
2. HTML and DHTML, - Laura Leray, SAMS, Techmedia.
3. Complete Reference JAVA, - Naughton Schildt.

**MEC-114: ADAPTIVE SIGNAL PROCESSING: (3-1-0) Credit : 4**

**Introduction:**
The following problem, Adaptive filters, approaches to adaptive filter theory, classification.

**The Adaptive Linear Combiner:**
General description, the performance function, Gradient and minimum MSE, example

**The LMS Algorithm:**
Derivation, convergence of the weight vector, learning curve, misadjustment. Modified version of LMS algorithm (Complex LMS, NLMS, sign error LMS, sign data LMS, sign-sign LMS, leaky LMS). Filtered-X LMS Algorithm.

**Frequency-Domain and Sub band Adaptive Filters:**
Block Adaptive Filters (Circular and liner), Fast BLMS algorithm, unconstraint frequency-domain adaptive filters, self-orthogonalizing adaptive filters, sub band adaptive filters.

**Recursive Least Square (RLS) Algorithm:**
Derivation algorithm and computational complexity, the Fast RLS algorithm.

Algorithm for adaptive HR filtering simple algorithm.
Adaptive Lattice Filter algorithm structure.

**Finite precision effects:**
Quantization errors, finite precision effects of LMS algorithm.

**Applications of Adaptive Filters:**

Reference Books:

MEC-115: DIGITAL IMAGE PROCESSING: (3-1-0) Credit : 4
Introduction
Brief overview of digital image fundamentals, image enhancement, image restoration
Color Image Processing
Color fundamentals, Color models, Pseudo-color image processing, Basics of full-color image processing, Color transformations, smoothing and sharpening, Color segmentation.
Wavelets and Multi-resolution processing
Introduction, multi-resolution expansions, wavelet transforms in one dimension, the fast wavelet transform wavelet transforms in two dimensions, wavelet packets.
Image compression
Fundamentals, image compression models, error-free compression, lossy compression, image compression standards.
Morphological Image Processing
Binary morphology-Dilation and erosion, opening and closing, edge detection and skeletonization, hit-miss, thinning, thinning and pruning, granulometries and pattern spectrum, gray-level morphology.
Image segmentation
Detection of discontinuities, edge linking and boundary detection, thresholding, region-based segmentation by morphological watersheds.
Representation and Description
Representation, boundary descriptors, regional descriptors, relational descriptors.
Object Recognition
Patterns and pattern classes, recognition based on decision-theoretic methods, structural methods.
Text Books:
1. Digital image processing by R.C.Gonzalez and R.E.Woods, Pearson Education-selected portions from ch. 6,7,8,10,11,12

Reference Books:
Digital Image Processing and Analysis by B.Chanda and D.Dutt Majumdar.PHI

MEC-116: EMBEDDED SYSTEMS: (3-1-0) Credit : 4
Introduction:
An Embedded system, Processor in the system, Other hardware units, Software embedded into a system, Exemplary embedded systems, Embedded System-on-chip (SOC) and in VLSI circuit.

Devices and Device Drivers:
I/O Devices, Timer and counting devices, Serial communication using the ‘I²C’, ‘CAN’ and advanced I/O buses between the networked multiple devices, Host system or computer parallel communication between the networked I/O multiple devices using the ISA, PCI, PCI-X and advanced buses, Device drivers, Parallel port device drivers in a system, serial port device drivers in a system, Interrupt servicing (Handling) mechanism.

**Software and Programming Concept:**
Processor selection for an embedded system, Memory selection for an embedded system, Embedded programming in C++, Embedded programming in Java, Unified Modeling Language (UML), Multiple processes and application, Problem of sharing data by multiple tasks and routines, Inter process communication.

**Real Time Operating System:**
Operating system services, I/O subsystems, Network operating systems, Real-Time and embedded system operating systems, Need of a well tested and debugged Real-Time Operating System (RTOS), Introduction to mC/OS-II.

**Case Studies of Programming with RTOS:**
Case study of an embedded system for a smart card.

**Hardware and Software Co-design:**
Embedded system project management, Embedded system design and co-design issues in system development process, Design cycle in the development phase for an embedded system, Use of software tools for development of and embedded system, Issues in embedded system design.

**Reference Books:**

**MEC-195: Telecommunication System Engineering Lab – II: (0-0-3) Credit: 2**

1) Simulation of error sources in digital channel
2) Channel Simulation
3) Protocol Analysis
4) Rake Receiver
5) Two experiment on Satellite Communication System
6) One experiment on Optical Communication System

**MEC-196: Wireless and Fibre Optic Communication Lab : (0-0-3) Credit: 2**

A) **Wireless Communication (Any Four)**
1) Simulation of larger scale path loss
2) Simulation of small scale fading and multi-path (Any one model)
3) Simulation of QPSK transmitter and receiver
4) Simulation of DS spread spectrum transmitter and receiver
5) Simulation of channel Equalizer for mobile channel
6) Simulation of Read-Solomon or Turbo and Trellis codes

B) **Fiber optic (Any Four)**
1) Fiber to Fiber Coupling Loss
2) Measurement of Connector Loss
3) Fiber bending Loss
4) Fiber Optic Analog Link
5) Fiber optic digital ling
6) Intensity modulated fiber pressure sensor