Department of Electronics and Communication
J.K. Institute of Applied Physics & Technology
University of Allahabad, Allahabad

M. Tech. (Electronics and Communication Engineering) Course Structure and Syllabus

M.Tech. 1st Semester (ECE)						
First Semester	Course Code	L-T-P-C	Credits	Four theory Paper & a Practical Lab	Sessional Marks	End Semester Marks
Paper – 1	MEC 501	3-0-0-3	3	Advanced Digital Signal Processing	40	60
Paper – 2	MEC 502	3-0-0-3	3	Digital Communication	40	60
Paper – 3	MEC 503	3-0-0-3	3	VLSI Technology	40	60
Paper – 4	MEC 504	3-0-0-3	3	Wireless Sensor & Actuator Networks	40	60
Practical	MEC 505	0-0-16-8	8	Practical Lab	40	60

M.Tech. 2nd Semester (ECE)						
Second Semester	Course Code	L-T-P-C	Credits	Four theory Paper & a Practical Lab	Sessional Marks	End Semester Marks
Paper – 1	MEC 506	3-0-0-3	3	Advanced Fiber Optic Communication	40	60
Paper – 2	MEC 507	3-0-0-3	3	Advanced Antenna Theory & Techniques	40	60
Paper – 3	MEC 508	3-0-0-3	3	Internet of Things (IoT)	40	60
Paper – 4	MEC 509	3-0-0-3	3	Elective	40	60
Practical	MEC 510	0-0-16-8	8	Practical Lab	40	60

M.Tech. 3rd Semester (ECE)						
Paper	Course Code	L-T-P-C	Credits	One theory Paper & Project	Sessional Marks	End Semester Marks
Paper – 1	MEC 601	4-0-0-4	4	Elective Paper	40	60
Project	MEC 602	0-0-32-16	4	Project – Phase I – Seminar	40	60
			6	Project – Phase I – Dissertation	40	60
			6	Project – Phase I – Viva Voce	40	60

M.Tech. 4th Semester (ECE)						
Project	Course Code	L-T-P-C	Credits	Project & Paper Writing	Sessional Marks	End Semester Marks
Project	MEC 603	0-0-40-20	6	Project – Phase II – Seminar	40	60
			6	Project – Phase II – Dissertation	40	60
			6	Project – Phase II – Viva Voce	40	60
			2	Paper Writing & Presentation	40	60

M.TECH FIRST SEMESTER
(Electronics Engineering)

Paper- 1: Advanced Digital Signal Processing

Unit 1-2: Statistical and Signal Processing **16 Lectures**

Signal Representation-Signal characteristics and their representation, Transform domain representation, Signal digitization Signal detection and classification, Linear multivariate model, Spatio-temporal signals, Non-parametric spectrum estimation, Least-square, Maximum-likelihood and mean-squared estimation, maximum a posteriori estimation, Wiener filtering, State-space Kalma filters,steepest-descent method of filtering Cyclostationary signal analysis.

Unit 3: Adaptive Filters **06 Lectures**

Convergence and robustness issue in the LMS adaptive filters, Recursive least-square adaptive filters, Transform domain adaptive filters Blind equalization.

Unit 4: Signal Reconstruction **06 Lectures**

Signal recovery problems, FBP, Series expansion and algebraic methods, EM method, simulated annealing procedure of reconstruction, Iterative restoration algorithm, Blind Deconvolution.

Unit 5: Time frequency and Multirate Signal Processing **12 Lectures**

Wavelets and filter banks, Properties of wavelets, New generation of wavelets Framelets,Ridgelets, Beamlets, Lifting methods, Lapped transforms, Orthogonal block transforms.

Nonlinear Signal Processing : Introduction to chaiotic signals and their processing, Nonlinear maps, Statistics of markov maps, fractal signals, Morphological signals, Higher-order spectral analysis.

References :

1. Advanced Digital Signal Processing and Noise Reduction :Saeed V. Vaseghi (John Wiley)
2. Digital Signal Processing : J.G. Prokis (PHI)
3. The Digital Signal Processing Handbook : V.K. Madisetti&Douglus B. Williams (CRC Press)
4. Intelligent Signal Processing :SymonHaykin& Kart Koski (IEEE Press)
5. Probability and Random processing with application to Signal processing Stark & Woods (Pearson Ed. Ltd.)
6. An Introduction to Wavelet Analysis: David F.Valnut (Birkhouser press)

M.TECH FIRST SEMESTER
(Electronics Engineering)

Paper- II: Advanced Digital Communication

Unit 1: Introduction **08 Lectures**

Review of binary signaling schemes, synchronous and asynchronous demodulation, matched filter and cross-correlator receivers, regenerative repeaters, link budget analysis.

Unit 2 & 3: Modulation and Demodulation in Presence of Additive White Gaussian Noise and ISI:

Different representation of narrow band signals and systems, Spectrum of digital modulated signals, Calculation of probability of error for binary & M-ary signals, digital signaling schemes for coherent and non-coherent demodulation. Comparison of different modulation schemes, Symbol synchronization and carrier recovery circuits.Design of band limited channels without ISI, Design of band limited signals for controlled ISI (partial response signals), Optimum demodulator in presence of ISI & AWGN noise. **16 Lectures**

Unit 4: Decision and Estimation Theory **08 Lectures**

Binary decisions with single and multiple observations, multiple decisions, fundamentals of estimation, maximum likelyhood and Bayes cost method

Unit 5: Spread Spectrum Modulation **08 Lectures**

PN sequences-generation & properties, Notion of Spread Spectrum, Direct sequence binary PSK system- BER, processing gain and antijam margin, Slow and fast frequency hopped spread spectrum, Application of Spread Spectrum systems

References:

1. Principles of Communication: Taub & Schilling (TMH)
2. Digital Communication : J.G. Proakis (TMH)
3. Digital Communication : S.Haykin (Wiley)
4. Decision and Estimation Theory by Melsa & Cohn

M.TECH SECOND SEMESTER
(Electronics Engineering)

Paper- III: VLSI Design & Technology

Unit 1: Introduction to VLSI Systems **10 Lectures**

•Layout Design Rules • Circuit characterization and performance estimation • Circuit Simulation • Combinational and sequential circuit design • Memory system design • Design methodology and tools

Unit 2-3: VLSI Design of Devices and Logic gates **20 Lectures**

Continuation of CMOS technology • Introduction to Very Large Signal Integration (VLSI) design • Digital circuits design concepts such as Flip Flops, Counters • Layout of Inverter, NAND, NOT, NOR gates using metal oxide semiconductor field-effect transistors (MOSFETs), NMOS, PMOS • CMOS logic, fabrication and layout • MOS Transistor theory, Schematic, Layout and simulation of different digital circuit.

Unit 4: Introduction to PLD and FPGA **10 Lectures**

Programmable logic devices (PLDs). Programmable gate arrays. Xilinx series FPGAs, FPGA- based system design.

M.TECH FIRST SEMESTER
(Electronics Engineering)

Paper- IV: WIRELESS SENSOR AND ACTUATOR NETWORKS

Unit 1: **08 Lectures**

Introduction, WSAN, Main Features of WSANs, Practical Issues of WSANs Related to Energy Management, Applications of WSANs, Environmental Monitoring, Health Care, Mood- Based Services, Positioning and Animal Tracking, Entertainment, Logistics, Transportation, Homes and Office, Industrial Applications, Event Detection and Spatial and Time Random Process Estimation, Categorization Of The Application Scenarios According To The HHA.

Unit 2 **08 Lectures**

Channel Modeling, Basics of Electromagnetic Propagation, Narrowband Channel Models, Modeling the Wireless Channel at 2.4 GHz for WSANs, Ultrawide Bandwidth Channel Models, Path Loss, Multipath Characterization.

Unit 3 **08 Lectures**

Connectivity and Coverage, Connectivity in Wireless Ad-Hoc and Sensor Networks, Link Connectivity, Single-Hop Link Connectivity, Multi-Hop Link Connectivity, Characterization of Interface, Network Connectivity, Network Connectivity for WSANs Coverage Vs Energy Efficiency.

Unit 4 **08 Lectures**

Technologies for WSANs, Zigbee Technology, Ultrawide Bandwidth Technology, Impulse Radio UWB, Low Complexity Receivers, UWB Standards For WSNs: the IEEE 802.15.4a PHY, Bluetooth Technology, Network Lifetime, Node Lifetime, Communication Protocols and Network Lifetime.

Unit 5 **08 Lectures**

Communication Protocols for WSANs, MAC Protocols, Scheduled Protocol, LEACH Protocol, Guo protocol, TRAMA Protocol, Contention- Based Protocol, Zhong Protocol, DMAC Protocol, PAMAS Protocol, SMAC Protocol, Routing protocols, Flat Routing, Flooding and Gossiping, SPIN Protocol, Direct Diffusion Protocol, Rumor Routing, Gradient- Based Routing, Hierarchical Routing, LEACH Protocol, PEGASIS Protocol, TEEN Protocol, MECN Protocol, SPAN Protocol, Location- Based Routing Protocols, GAF Protocol, GEAR Protocol, GeRaF Protocol, Rugin Protocol.

Reference:

1. *Wireless Sensor and Actuator Networks: Technologies, Analysis and Design by R. Verdone, D. Dardari, G. Mazzini, A. Conti- Academic Press Publication.*
2. *Wireless Sensor Networks: Signal processing and communication perspectives edited by A. Swami, Q. Zhao, Y.W. Hang, L. Tang- Wiley Publication.*

M.TECH SECOND SEMESTER

(Electronics Engineering)

Paper I: Advanced Fiber Optic Communication Systems

Unit 1: Review **08 Lectures**

Propagation of optical signal through different types of fibers; different types of attenuation and dispersions, receiver operations and SNR.

Unit 2: Link analysis: **08 Lectures**

Receiver structures, performance of receivers, Power budget and rise time budget equations. Splice and joint losses, mis-alignment losses. Source to fiber and fiber to detector coupling losses, Selection of wavelength, source and detectors.

Unit 3: Nonlinear Effects in Optical Fibers and Optical Amplifiers:,

Different types of non-linear effects; self phase modulation, four photon mixing and solitcons, Effects of nonlinear effects on the performance of fiber optic systems. Different types of optical fibers, EDFA, Raman and fiber amplifiers.

Unit 4: Wavelength Division Multiplexing

WDM concept, architectures and networks, Different components used in WDM, Multiplexers, demultiplexers, couplers, tunable filters etc., DWDM, Crosstalk in DWM systems.

Unit 5: Coherent Optical Fiber Systems: **08 Lectures**

Basic system configuration, Practical constraints, Modulation formats, Detection Principle and demodulation schemes, Receiver sensitivities and their comparison, Dual-detectors receivers.

References:

1. Optical Fiber Communication: Gerd Keiser
2. Optical Fiber Communication: John M. Senior
3. Optical Fiber Telecommunication III B: Ivon P Kaminow & Kock
4. Fundamentals of Fiber Optics in Telecommunication and Sensors System: B P Pal
5. Optical Communication Receiver Design- B: Stephen Alexander

M.TECH SECOND SEMESTER
(ELECTRONICS ENGINEERING)

Paper II: Advanced Antenna Theory & Techniques

Unit 1: Wire Antennas: **08 Lectures**

Review of antenna basics, Vector Potentials and their applications in field calculation, radiation characteristics of Loop antenna and Helical antenna and their applications.

Unit 2: Aperture type Antennas: **06 Lectures**

Babinet's Principle and complementary antennas, Radiation characteristics Slot and Horn Antennas and their applications, Design of pyramidal and conical horns.

Unit 3: Reflectors and lens Antenna: **10 Lectures**

Study of different types of reflectors, Focussing characteristics, Analysis and design of a Parabolic reflector antenna, Feeding techniques of Parabolic refector, Cassegrain and Gregorian antenna, Dielectric lens antenna, E-plane and H-plane metal lenses, Luneburg lens antenna.

Unit 4: Microstrip Antenna: **10 Lectures**

Introduction, radiation mechanism and special features of microstrip patch antenna, Advantages and limitations, Application, Feeding techniques- Contactual & noncontactual, Overview and comparison of analytical models for microstrip patch antenna, Analysis and Design of rectangular microstrip patch antenna, Bandwidth enhancement techniques, Comparison of slot antenna with microstrip antenna, Different types of substrate materials used for design of microstrip antenna.

Unit 5: Antenna for Special Applications: **06 Lectures**

Ground plane Antenna, Sleeve Antenna, Turnstile Antenna, Superturnstile antenna, Antenna design consideration for satellite communication.

References:

1. Antennas and Wave Propagation — John D Kraus[et.al] [TMH]
2.Antenna Theory: Analysis and Design — C.A. Balanis [John Wiley & Sons]
3.Antennas for All Applications — J.D. Kraus &R.J.Marhefka[McGraw Hill Inc]
4.Microstrip Antenna Design Hand Book — R. Garg, Prakash Bhatia, InderBahl [Artech House Publisher]
5.Broadband planner Antennas: Design and Applications — Z.N. Chen & MYW Chia [John Wiley & Sons]
6.Microstrip Patch Antenna — Kai Fong Lee &Kwai Man Luk [Imperial College Press]
7.Wideband CDMA for "Third Generation Mobile Communication" — Ojanpera T. & R. Prasad [Artech House]

M.TECH SECOND SEMESTER

(Electronics Engineering)

PAPER III: INTERNET OF THINGS

UNIT 1: INTRODUCTION TO THE INTERNET OF THINGS 08 Lectures

Introduction, History of IoT, About objects/things in the IoT, The identifier in the IoT, Enabling technologies of IoT, About the Internet in IoT.

UNIT 2: RADIO FREQUENCY IDENTIFICATION TECHNOLOGY (RFID) 08 Lectures

Introduction, Principle of RFID, RFID reader, RFID tag, RFID middleware, RFID applications, Logistics and supply chain, Production, Monitoring and Maintenance, Product Safety, Quality and Information, Access Control and Tracking and Tracing of Individuals, Loyalty, Membership and Payment, Household, Other Applications.

UNIT 3: RFID DEPLOYMENT FOR LOCATION AND MOBILITY MANAGEMENT 08 Lectures

Introduction, Background and related work, Localization and handover management relying on RFID, Conceptual Framework, Technology considerations, Path loss model, Antenna radiation pattern, Multiple tags-to-reader collisions, Multiple readers-to-tag collisions, Reader-to-reader interference, Interference from specific materials, Performance evaluation.

UNIT 4 : Power Line Communication Technology (PLC) 08 Lectures

Introduction, Overview of existing PLC technologies and standards, History of PLC technologies, Different types of in-home PLC technologies, Security, Performances of PLC technologies, Standards and normalization, Architectures for home network applications, Architecture for a high bit-rate home network application, Architecture for low bit-rate home network application, Internet of things using PLC technology, Connecting objects in the indoor environment, Interoperability of connecting objects in the home environment

UNIT 5: INTERNET OF THINGS –STANDARDS AND GOVERNANCE 08 Lectures

Introduction, Standardizing the IoT, Exploiting the potential of RFID, Identification in the IoT, Promoting ubiquitous networking: anywhere, any when, any what, Safeguarding data and consumer privacy, Bodies subject to governing principles, Substantive principles for IoT governance, IoT infrastructure governance, Further governance issues.

REFERENCES:

1. The Internet ofThings:Connecting Objects to the Web – Hakima Chaouchi - Wiley.
2. RFID Handbook – Klaus Finkenzeller, Wiley.
3. Architecting the Internet of Things - Dieter Uckelmann, Mark Harrison; Florian Michahelles - (Eds.) – Springer 2011.
4. Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press – 2010.
5. The Internet of Things: Applications to the Smart Grid and Building Automation by - Olivier Hersent, Omar Elloumi and David Boswarthick - Wiley -2012.
6. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things-Key applications and Protocols”, Wiley, 2012.

M.TECH SECOND SEMESTER

(Electronics Engineering)

Paper IV A (Elective): Embedded Systems

Unit 1: Introduction to Embedded Systems: 08 Lectures

Embedded System Overview,Common Design metrics, General Purpose Processors and Application Specific Processors. Software and hardware combination for making an Embedded System.Concept of various types of memories for implementation of Embedded Systems.

Unit 2: Selection Criteria of Hardware for Embedded System Design: 08 Lectures

Comparing use of Microprocessor and Microcontroller, PLDs and FPGA for developing an Embedded System. Elementary idea of commonly used microcontroller. Criteria for selection of microcontroller and other interfacing hardware.Architectural block diagram of MCS 51 microcontroller family. Memory organization. Code Memory, Data memory and special function register. Internal circuit and capabilities of various I/O ports pins.

Unit 3: Working of microcontrollers: 08 Lectures

Clock cycles, Machine cycle and Instruction cycles and timing diagrams for various essential control signals. Division of Machine cycles in to states and phases.

Instruction length and execution time for instructions. Categorization of instruction and various addressing modes. Conditional and unconditional jump instructions.Boolean instructions. Read pin and read latch instructions.SFRs and their purpose. Control of interrupts. Timers, Power status and I/O functions by SFR's. Addressing of SFR's. Various modes of Timers and their controls.

Unit 4: Interfacing: 08 Lectures

Block diagram for Input Output Ports internal Structures and their capabilities for 89C51 and 89C2015 Microcontrollers. Interfacing with external devices. Address for ports and pins. Interfacing with external hardware keys and displays devices. Circuits and criteria for interfacing LEDs,Seven segment display.

Unit 5: Programming: 08 Lectures

Instruction format for instruction of MCS-51 family microcontrollers. Program and Machine control. Boolean variable manipulation. Data transfer. Arithmetic and Logic Operations. Interrupts and data polling for multiple subroutines in a program. Look up tables and use of data stored in code memory.

References:

[1] Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems.
[2] C. K. Dwivedi, Solid State circuit design with Microcontrollers.
[3] Ayala Kenneth:The 8051 microcontrollerArcitecture, Programming and Applications.
[4] Raj Kamal: Embedded Systems- Architecture, Programming and Design.
[5] Raj Kamal: Microcontrollers

M.TECH SECOND SEMESTER

(Electronics Engineering)

Paper IV B (Elective): Ubiquitous Computing

Introduction:

Real life example of ubiquitous computing, Major trends din computing (mainframe, desktop and ubiquitous computing), Wearable computing, Pervasive computing: Design Issues for Ubiquitous Computing, Integration and Processing of Sensor-Based Input; Wireless Infrastructures; Sensing and Context Awareness, Use of RFID, Some Computer Science Issues in Ubiquitous Computing.

Essential technologies for ubiquitous computing:

Operating environment, Networking, Sensors, Location sensing; Smart Environment, Smart Devices, Perceptual components, Multisensor perception, answering machine, Room ware, Wireless sensing environment.

Wireless standards & protocols:

Wireless network types and standards, Ad-hoc network, Sensor network, IrDA, Bluetooth, 1EEE 802.11, WLAN, Wireless link, 802.11 LAN architecture, Bluetooth architecture, Sensor and smart spaces, Sensor Networking and sensor protocol, Mobility and Mobile networking, Mobile IP.

Cellular networks:

Mobile radio communication, Cellular system architecture GSM and CDMA, WCDMA.

Performance & QoS issues in wireless networks:

Network performance measures, Quality of Service, Need of feedback control, Bandwidh sharing and faimess, TCP over link, Packet Loss, Single cell and multicell wireless networks, Saturation throughout analysis, Real-time examples.

Privacy & Security:

Issues, Challenges, Attacks in Privacy & Security, Security issues in sensor networks, Security issues in ad-hoc networks, Resurrecting Duckling model of security.

Mobile computing:

Mobile computing vs. Distributed computing, Characteristic of mobile network, Mobile computing models, Unaware client/server model, Thin client/server model, Disconnected operation, Dynamic client/server model, Mobile agents, Challenges in mobile computing, mobile computing and databases.

Context aware computing:

Context-aware systems, Context-aware architecture, Context-aware applications, Adaptive GSM Phone/PDA, Handling multiple context, Issues and challenges.

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M.TECH SECOND SEMESTER

(Electronics Engineering)

Paper IV C (Elective): Advanced Computer Architecture

Unit 1: CPU architecture: **08 Lectures**

Comparative study of 32-bit processors; Comparative study of Microcontrollers; Future Trends

Unit 2: Parallel Processing Systems: **08 Lectures**

Flynn's Classification, Pipeline Processors, Instruction Pipelining, Internal Forwarding, Pipeline Hazards, Tightly & Loosely coupled systems; Job Sequencing & Collision prevention, Interleaved Memory; Amdahl's Law; Vector Processing, Design of Vectorizing compilers, Automatic detection of parallelism,

Unit 3: Case Studies of Array & Vector Processors: **08 Lectures**

Case studies of vector processors, Array processors, Network design issues, Mesh Network, Barrel Shifter, Cube, Hypercube, Parallel algorithms on hyper cubes, Multiprocessor system, Multiprocessor interfacing schemes

Unit 4: Other Architectures: **08 Lectures**

RISC; Comparison with CISC; Parameter passing in RISC, Comparison of commercial RISC systems; Systolic Architecture; Data flow architectures; Comparison with control flow systems; Template implementation; Transputer architecture; Communication channels; Occam & programming environment

Unit 5: Introduction to Parallel Algorithms: **08 Lectures**

Addition on Tree, Cube, Mesh, Linear Array, PSN, etc. Matrix multiplication on Mesh, Cube, Torus, etc.; Parallel Sorting; Associative Processing

References:

1. Computer Architecture & Parallel processing – Hwang & Briggs
2. Computer Architecture – Jean Loop Bear
3. Introduction to Distributed and Parallel computing- Crichlow
4. Designing Efficient Algorithms for parallel Computers- M.J.Quinn
5. Introduction to Parallel Algorithms- Joseph JA
6. The Design and Analysis of Parallel Algorithms- S.G.Akl

M.TECH THIRD SEMESTER

(Electronics Engineering)

Paper I A (Elective) : Techniques of Microstrip Patch Antenna Design

Unit 1. **08 Lectures**

Microstrip Antenna Design Consideration and characteristics, Patch Parameters, Substrate selection Directivity, Gain, Radiation efficiency, Polarization, Losses and Quality Factor, Bandwidth, Effect of Dielectric cover, Feeding Techniques, Feed Point Location and Finite size Ground Plane.

Unit2. **08 Lectures**

Microstrip Analytical Models: Transmission line Models, Cavity model, Multiport network model, Basic characteristics of some common Patches: Rectangular Patch, Circular Patch, Semi Circular and Circular sector, Equiangular Patch and annular ring Patch.

Unit 3. **08 Lectures**

Overview of Broadbanding and Dual banding techniques of microstrip Antenna and their Comparative studies.

Unit 4 **08 Lectures**

.Microstrip Slot antenna: Introduction, Equivalent circuit, Determination of network quantities, Inclined slot, Radiation pattern, CPW- Fed slot antennas, Annular slot and Tapered slot and comparison of slot antennas with Microstrip antennas.

Unit 5 **. 08 Lectures**

Loaded Microstrip antennas and applications: Polarization diversity using Microstripantennas, Frequency agile Microstrip antennas, Varactor-tuned Microstrip antennas, Optical Tuning of patch antennas and Planar Inverted-F antennas.

References:

1. Antennas and Wave Propagation John D Kraus[et.al] [TMH]
2. Antenna Theory: Analysis and Design C.A. Balanis [John Wiley & Sons]
3. Antennas for All Applications J.D. Kraus &R.J.Marhefka[McGraw Hill Inc]
4. Microstrip Antenna Design Hand Book R. Garg, Prakash Bhatia, InderBahl [Artech House Publisher]
5. Broadband planner Antennas: Design and Applications Z.N. Chen & MYW Chia [John Wiley & Sons]
6. Microstrip Patch Antenna Kai Fong Lee &Kwai Man Luk [Imperial College Press]
7. Wideband CDMA for “Third Generation Mobile Communication”Ojanpera T. & R. Prasad [Artech House]

M.TECH THIRD SEMESTER

(Common to EE and CT)

PAPER I B (Elective): Advanced Embedded Systems

Unit 1: Review to Embedded system

Architecture &Instruction set of MCS-51 family microcontrollers. Delay generation. Look-up tablesand their use as decoder.Interrupt & data polling techniques for multitasking operations in microcontrollers.Optimization by hardware and software partitioning.

Unit 2: Reliable & Redundant design

Reliability considerations.Considerations of life time for electronic components under various operating conditions. Function of watch dog timer In microcontrollers. Design of Redundant hardware circuits. Hardware software optimization for reliable and redundant systems with simple interfacing circuits

Unit 3: Interfacing in harsh environment

Input to microcontrollers from switches and relays. Effects of contact bounce and Its reduction by hardware circuit. Software techniques to neutralise the effect of contact bounce. Operation of microcontroller in presence of EMI & RFI. Microcontroller I/Ointerfacing for high voltage and high current switching. Decoupling with opticalIsolators.Reduction of clock frequency to avoid effects of switching transients and enterferences.

Unit 4: PLC Design with microcontroller

Symbols used In PLC diagram for representation of relays, contacts, actuators and motors for conveyer belt drive and other process. Ladder diagram representation and simple case studies for PLCs. Design of PLC using microcontroller.

Unit 5: Special design considerations in modem microcontrollers

Provisions of handling analogue Input and output data in microcontrollers. Analogue comparators, A/D converters and PWM output techniques used for analogue operation of microcontrollers. Enhanced port pin current capabilities in microcontrollers.

References:

1. Solid state circuit Design with Microcontrollers: C.K.Dwivedi.
2.The 8051 Microcontroller Architecture, Programming & Application: Kenneth J. Ayala.
3.Microcontrollers :Rajkamal

M.TECH THIRD SEMESTER

(Electronics Engineering)

PAPER I C (Elective): Advanced Mobile Communication

Unit 1: TIA IS-95 CDMA: **08 Lectures**

Critical challenges of CDMA, IS-95 CDMA System: Forward Link (Down Link), Reverse Link (Uplink), Physical and Logical Channels of IS-95, CDMA IS-95 Call Processing, CDMA registration, Authentication.

Unit 2: Evolution of 2G Systems to 3G Systems: **08 Lectures**

Third Generation Standard Activities, IMT 2000, Global Partnership Projects, IMT 2000 Family of Systems; Evolution of TDMA-Based 2G Systems to 3G Systems, GSM Evolution for Data, HSCSD, GPRS, EDGE.

Unit 3: Basics of cdma 2000 System: **08 Lectures**

Introduction, Soft Handoff and Power Control; cdma 2000 Layering Structure; cdma 2000 Channels, cdma 2000 MAC and cdmaOne, Data Services in cdma 2000, Evolution of cdmaOne (IS-95) to cdma2000

Unit 4: Third Generation European Standards: **08 Lectures**

Introduction; W-CDMA, Physical Layer, Logical Channels, Scrambling Codes, Spreading/Modulation, MAC and RLC Protocols, Power Control

Unit 5: UMTS **08 Lectures**

Network Architecture, UTRA FDD and TDD modes: Power Control, Handover, System Performance

References:

1. Wireless Network Evolution 2G to 3G: Vijay K. Garg (Pearson Education)
2. GSM, cdmaOne and 3G Systems by R. Steele, C. C. Lee, P. Gould, Wiely

M.TECH FOURTHSEMESTER

(Electronics Engineering)

PROJECT ONLY