

**MASTER OF TECHNOLOGY COURSE IN
DIGITAL COMMUNICATION**

(MDC-01) COMPUTATIONAL METHODS FOR COMMUNICATION

Theory paper: 100 Marks

Sessional: 50 Marks

Solution of linear simultaneous and transcendental equations. Eigen values problems. Iterative method. Jacobi's method. and solution of communication problem. Analytical method. separation of variables orthogonal functions, series expansion, some practical applications of communication. Numerical integration, Euler's rule. Trapezoidal rule. Simpson rule. Newton Cote's method, Newton - Raphson method and Gaussian Quadrature method. Finite Element. method, solution of poisson and wave equations and other communication problems. Basic MATAB function and applications. Fuzzy Set theory and application to communication problems. Fuzzy MATLAB tools
OFT. FFT and MAT LAB tools for wavelet transform.

Suggested Text Books and References:

- 1 Numerical methods in science & engineering, Or MK Venkataraman, The national pub Co. 1991.
- 2 Computer Oriented statistical and numerical methods, B. Balaguru Swamy, Macmillan India ltd 1998
- 3 Numerical methods for scientific and engineering computation, M.K Jain, S.R.K Iyengar and R.K Jain, Wiley Eastern ltd, 1987
- 4 Communication Systems, S Haykins, John Wiley and Sons

(MDC-02) SATELLITE COMMUNICATION

Theory paper: 100 Marks

Sessional: 50 Marks

Evolution of Satellite Technology, Communication Satellites, Satellite frequency Bands. Satellite Channel analysis, cross-links, Carrier to Noise ratios, Frequency reuse with spot beams. Multiple beams

Satellite front end, Front-end noise Noise temperature, Front end filters.

Satellite multiple access methods. FOMA, TOMA. COMA Systems. OS-COMA and frequency hopped COMA, Satellite jamming. Code acquisition and tracking.

Satellite applications. Data Communication and VSAT network Mobile satellite services (GEO and NONGEO)

Suggested Text Books and References:

1. The Satellite Communication applications handbook. By Brauce. R. Elbert Artech House, Inc 1997
2. Electronic Communication Systems by Wayne Tomasi. Regents Prentice Hall, 1988.
3. Satellite Communication by Robert M Gagliardi, CBS Publisher & 1st ed. 1987
4. Digital Satellite Comm By Tri. T. Ha, Mc Graw Hill.

(MDC-03) ADVANCED DIGITAL COMMUNICATION

Theory paper: 100 Marks

Sessional: 50 Marks

Digital PAM. binary PAM formats, line coding. bandlimited digital PAM systems. Nyquist pulse shaping, equalization, synchronization techniques. bit and frame synchronization. Coded pulse modulation. voice digitization rate (VDR) of PCM, DPCM. DM. ADM. CVSD. log PCM, their performance: comparison, VDR reduction by speech coding. VOCODERS. noise performance of PCM and DM, Digital multiplexes. AT & T and CCITT hierarchies. quasi-synchronous multiplexes. Digital CW modulation, BPSK. DPSK, DEPSK. QPSK, M'ary PSK, QASK. BFSK. M-Doubinary encoding. QPR coherent and non-coherent systems. error probabilities in M-PSK, DPSK. FSK, QPSK, 16 QAM. MSK, QPR and bit. Matched correlation and optimum filters and symbol error rate. Spread Spectrum techniques: DS. CDMA, FH. PN sequence, Power requirement. PN-C sequence code. and Walsh's code. ISDN & Value added communication system simulation & Analysis using MATLAB & Simulink Application using communication toolboxes.

Suggested Text Books and References:

- 1 Digital Communication By Haykins Mc Graw Hillint Editio".
2. Modern Digital & Analog Communication. By B P Lathi.. Willey Eatern Ltd. 2000.
3. Communication. Systems by A B Carlson. Tata Mc Graw Hill. 2000.

(MDC-06) OPTICAL COMMUNICATION

Theory paper: 100 Marks

Sessional: 50 Marks

Int. to optical communication, principles of light transmission. optical fiber modes and configuration. Mode theory for circular waveguides. single mode fibers. Multi - mode fibers. Numerical Aperture. Mode Field Diameter. V-Number. Fiber Fabrication Technique.

Optical sources. L.E.D's, LASER Diodes, Modal Reflection Noise, Power Launching & Coupling. Population Inversion. Fiber splicing, optical connector, photo detector PIN. Avalanche, Detector Response Time, Avalanche Multiplication Noise
Signal Degradation in optical fibers. Attenuation losses. signal distortion in optical waveguides, material dispersion, waveguide dispersion, chromatic dispersion, Intermodal distortion, pulse broadening in graded-index fibers. mode coupling. Advance fiber design:

Dispersion shifted. Dispersion flattened. Dispersion compensating fiber. Design optimization of single mode fibers.

Coherent optical fiber communication. Modulation Techniques, Misalignment, Fiber to Fiber joints.

Optical Fiber Link Design: Rise Time Budget and Link power Budget. Long-Haul systems. Bit error Rate.

Line Coding: NRZ. RZ, Block codes, Error correction.

WDM concepts and components. operation, fiber gratings, Hologram, Tunable Filters, Directional coupler.. Dispersion Management.

Optical Amplifiers - EDFA, Photonic Switching.

Optical Networks - SONET/SDH. Optical Interfaces. Ring Topology, Star Architecture

Suggested Text Books and References:

1. G. Keiser, "Optical Fiber Communication (3rd Edition)". Mc Graw Hill International, 2000.
- 2 D.F Mynbacy and L. Scheiner. "Fiber optic communication technology", Pearson Education.
3. (Ghatak and K. Thyangarajan. "Int. to fiber optics. Cambridge University press, 1998.

(MDC – 07) COMPUTER COMMUNICATION

Theory paper: 100 Marks

Sessional: 50 Marks

Study or function TCP/IP ref. Model in computer networks. Switching techniques & Switches, Broad band ISDN & ATM. Polling techniques, multiplexing & concentration, LAN components, transmission media used in physical layer, X.25 networks.

Queuing theory, Max. Flow Algorithm, Introduction to LAN, WAN, LAN protocols, ALOHA, IEEE standards for LAN High speed fiber optic networks, FDDI, SONET satellite networks, packets radio networks. Data link layer protocols, error detection & correction codes in DLL. Protocol performance evaluation, protocol specification & verification, Routing and congestion in network layer, routing & congestion control algorithms Network layer in Internet and ATM networks. Network synchronization, traffic

analysis, Network management in routing control

Connection management in transport layer. Protocols or transport layer Internet transport protocols like TCP, UDP etc. ATM protocols

Data security & cryptography techniques, access management in application layer,

World Wide Web, e-mail, concept or virtual terminals.

Study or different computer networks

Suggested Text Books and References:

1. Computer Network. Tanenbaum, P.H..I publication
2. Data and Computer Communication: William Stalling
- 3 Computer and internet, by Comer, McGraw Hill.

(MDC-10) DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS

Theory paper: 100 Marks

Sessional: 50 Marks

Discrete Time signals - sequences, representation

Discrete Time Systems - linear, Time invariant, LTI System, properties, constant - coefficient difference equation.

Frequency Domain Representation of discrete time signals & systems

Discrete - Time Random Signals

Z Transform - properties, R.O.C, stability, Causality criterion

Inverse Z- Transform. Recursive and Non recursive systems, Realization of discrete time system

D.F. T - properties, linear and circular convolution

Discrete Cosine transform, relationship between OFT & OCT.

I.DF T , computation of D.F. T : F.F. T - Decimation in time & Decimation in frequency.

F.I.R and I.I.R Systems: Basic structure of FIR & IIR, Bilinear transformation, Design of discrete time I.I.R filters - Butterworth, Chebychev, Inv. Chebychev, elliptic etc.

Design of F.I.R filters by windowing - rectangular, Bartlett, Hann Hamming, Kaiser window filter, Design method, Relationship of Kaiser to other windows.

Application or MATLAB for design of digital filters

Effect of finite register length in filter design.

Advanced signal processing techniques and transforms: Multirate Signal processing -

Down sampling/upsampling, Int. to discrete Hilbert transform, wavelet transform, Haar transform etc

Application or DSP to Speech Signal Processing.

Suggested Text Books and References:

1. A. V Oppenheim and R.W Schaffer, "Discrete-Time signal processing"(2nd edition) Prentice Hall
2. S. Miura "Digital Signal Processing using MATLAB", 2nd Edition.
3. Proakis, "Int. to Digital Signal Processing", Maxwell Mcmillan.

(MDC-11) INFORMATION THEORY AND CODING

Theory paper: 100 Marks

Sessional: 50 Marks

Information theory: Marginal, joint and conditional entropy, information rate, mutual information, channel capacity of various channels, Cascaded channels, repetition of signals

Shannon's theorem, Shannon - Hartley theorem, BW-S/N ratio trade off, continuous channel, negative entropy.

Coding: Irreducibility, separability, coding efficiency, source encoding, Shannon-Fano code, Huffman code, Data compression,

Channel encoding - minimum distance, error detection and correction, FEC and ARQ, block code, convolutional codes, cyclic codes, signal error correction, multiple error correction, Burst error correction, Cryptography, Encryption, Decryption,

Suggested Text Books and References:

- 1 Information theory: F.M Reza, McGraw Hill
- 2, Digital and Analog Communication Systems: K.Sam Shanmugam, John Wiley
- 3, Communication Systems: Analog and Digital: Singh & Sapre, TMH, 1995.
4. Digital Communication: B. Sklar, Pearson Education Asia.

(MDC-15) MODERN TELEPHONE SWITCHING SYSTEMS

Theory paper: 100 Marks

Sessional: 50 Marks

Electronic space Division switching :- Stored program control (SPC), switching matrices, multistage switching, enhance services photonic switching.

Time Division switching :- Time division space, and time switching, multiplexed switching, combination switching, T -S, T -S- T, switching n-stage combination switching,

PBX switching, PBX networking, digital PBX.

Traffic Engg. :- Traffic load, Grade of service, Erlang's formulas, blocking modeling switching systems, Blocking model.

Subscriber Loop, Dialing Systems :- Switching hierarchy & routing, Transmission plan, numbering plan, charging plan, signaling technique.

Local Access Techniques :- Digital subscriber lines, DSL, ADSL etc, WLL, FIL." wireless for local telephone services.

Suggested Text Books and References:

- 1 Telecomm. Switching systems & networks- Thaigrajan PHI
2. Comm, System - Taub & Schilling, Mc Graw Hill
3. Telecomm. & the Computers - James Martin - PHI
4. The Essential Guide to Telecomm - Pearson Educah - Annabelz Dodd.

(MDC-16) MOBILE COMMUNICATION

Theory paper: 100 Marks

Sessional: 50 Marks

An overview of wireless communication systems. First generation analog cellular systems, second generation digital cellular systems, third generation systems standards for wireless communications systems GSM, IMT -2000, UMTS. Mobile Satellite Communication - GEO, LEO, MEO, Terrestrial mobile system.

Cellular communication fundamentals. Cellular systems. Geometry of a Hexagonal Cell. Co-channel interference ratio. Cellular system design in worst case with an omnidirectional antenna, co-channel interference reduction with use of directional antenna.

Cell splitting Frequency and spectrum management and handoffs Access Techniques. ,'

GSM architecture and interfaces. GSM frequency bands. GSM PLMN. GSM PLMN Services. GSM interfaces. The Radio interface MS to BTS. Abis interface (BTS to MSC). Interface BSC to MSC

Radio Propagation and cellular engineering concept. Propagation characteristics. Multipath faded radio signals Radio link design. Receiver sensitivity and link budget. Data services in GSM GSM GPRS. Privacy and security in GSM

Suggested Text Books and References:

1. Wireless Digital Communication- Feher 1991. PHI.
2. Principles & applications of GSM - Vijay K. Garg. and J.E. Wilkes 1999 Prentice hall PTR.
3. Telecom Transmission handwook4th ed Roger L. Freeman 1998 John Wiley & Sons Inc New York.
4. Mobile Cellular Telecomm. Lee 1995 Mc Graw Hill Inc.

(MDC-17) ELECTIVE I

Theory paper: 100 Marks
Sessional: 25 Marks

(i) DESIGN OF COMMUNICATION NETWORKS

Design considerations: Analog design trade offs - Bandwidth, performance, systems ~ complexity.

Digital design trade offs - performance, bandwidth. bps/Hz comparisons, digital communication design requirements.

Design features of a computer communication networks: response time. throughput. link design. cost complexity. flow control. security aspects.

Design of cellular mobile system: design parameters at the base station. design parameters at the mobile unit. criteria of signaling design. channel assignment.

Case studies: Paging systems. Cellular telephone. Global positioning satellite.

Network planning for digital microwave network. optical communication. satellite networks. design aspects of LAN. MAN and WAN

Suggested Text Books and References:

1. Analog & Digital Communication Systems - Martin S. Rodess. Prentice Hall of India Pvt. Ltd. New Delhi. 3rd Edition.
2. Data Communications and Distributed networks - U.D Black. Prentice Hall of India Pvt. Ltd New Delhi 3rd Edition 1997.
- 3 Mobile communications design fundamentals - Williams C.Y Lee. 2nd edition TMH. 1995.

(ii) INTERNET AND INTRANET

Development of Internet. Designing principles of Internet. Internetworking architecture
Internetworking issues.

Network layer structure. Internet protocol standards, Internet IP. Ipv6 The ISO Internet
protocol. ISO routing protocols.

The world wide web: Web fundamentals, URL . Web protocols- HTTP. SSL.

Services HTTP other web tools. FTP, HTML. Java. VRML. Jargon IRC. WAIS.

Net components: Internet terminology, provider. client & browser, services. viewers.

Gateway and Routers.

Net applications: e mail, Netnews, Telnet, e-commerce Network security firewalls,
Digital Signature.

Intranet and extranet.

Suggested Text Books and References:

1 Data Communication, Computer Network and Open system: F Halshal. Addison
Wesley.

2. Internetworking with TCP/IP: Volume I: Comer, PHI.

3. Launching Business on the Web: David Cook, PHI.

(iii) DETECTION AND ESTIMATION THEORY

Stochastic signal, orthogonal representation of signals, random process, Markov process,
correlation function, power spectral density, Tchebycheff inequality

Detection in presence of noise, correlator, optimum filter, matched filter.

Weighted probabilities and hypothesis testing, composite hypothesis, likelihood ratio
detection, sequential detection.

Principles of estimation, properties of estimator, Cramer - Rao Bound, Baye's maximum
likelihood and least square estimation, parameter estimation, estimation of continuous
waveforms, time invariant linear estimation

Suggested Text Books and References:

1. Principles of Digital Communication: J Das, S.K Mullick, P.K Chatterjee, New age
International (P) Ltd publisher, New Delhi

2. Modern Digital and Analog Communication Systems, B.P Lathi, Oxford publishers.

(iv) Energy Conservation & Management

(MDC-18) DIGITAL IMAGE PROCESSING

Theory paper: 100 Marks

Sessional: 50 Marks

Introduction to Image Processing System:

Digital Image Fundamentals:

Image model, Relationship between pixels, Imaging Geometry, Camera model.

Manipulation on Images:

Images Transformation: Introduction to FT, DFT & FFT. Walsh transformation, Hadamard transformation, Hotelling transformation, Histogram.

Image Smoothing:

Neighborhood averaging, Median filtering lowpass filters, average of multiple images, Image sharpening by differentiation technique, High pass filtering.

Image Restoration:

Degradation models for continuous function, effect of diagonalization. On degradation. Algebraic approach to restoration Interactive restoration, gray level interpolation.

Image Encoding & Segmentation:

Encoding: Mapping, Quantizer, Coder

Segmentation: Detection of discontinuation by point detection, line detection, edge detection.

Edge linking & boundary detection: Local analysis, Global by graph theoretic techniques,

Thresholding : Definition, Global thresholding

Filtering: Median, Gradient .

Simple Method of representation signatures, Boundary Segments, Skeleton of region

Suggested Text Books and References:

1 Digital Image Processing: Gonzalez & Wood. Addison-Wisley Publisher Compo 1993 ,

2 Digital Image Processing: A.K Jain. PHI. Edition 1995

ELECTIVE II

Theory paper: 100 Marks
Sessional: 25 Marks

(i) COMPUTER COMMUNICATION

Introduction to computer network-Protocols, the layered approach, reference models-OSI and TCP/IP, Example networks-Novell NetWare, ARPANET, the Internet, Physical Layer-Transmission media, wireless transmission, cellular radio, data link layer, sliding window protocols, example data link protocols

Medium Access Sublayer - Channel allocation, multiple access protocol, IEEE standards, Ethernet, token bus, token ring, DODB, logical link control high speed LANs, satellite networks

The network layer - Design series, routing algorithms, congestion control algorithms, IP protocol network layer in ATM networks.

The transport layer - Transport services and clients of protocols, TCP and UDP the application layer, network security, recent key and public key algorithms, SNMP-simple network management protocol,

Suggested Text Books and References:

1. Computer Networks - W.S. Tanenbaum
2. Data and Computer Communication - William Stallings

(ii) MICROWAVE COMMUNICATION

Microwave radio system: Transmitter & receivers block diagram, FM microwave repeater, diversity protection, microwave terminal station, repeater station

I Microwave links: Block design path characteristics, system gain, free space path, i SIN ratio.

I Microwave digital communication block diagram, regeneration repeater, digital modulation & demodulation at microwave frequencies analog & digital multiplying, line codes. Local microwave distribution system.

Propagation of microwave: line of sight, duct propagation as superrefraction, Troposcatter links.

Suggested Text Books and References:

- 1 . Advance Electronic Comm System. W Tomasi, PH
2. Electronic Comm. Systems II Edition Roy Blake Thomsar
3. Electronic Comm, Kemealy & Dakis TMH

(MMW-18) SATELLITE COMMUNICATION

Theory paper: 100 Marks

Sessional: 50 Marks

Evolution of Satellite Technology, Communication Satellites, Satellite frequency Bands
Satellite Channel analysis, cross-links, Carrier to Noise ratios, Frequency reuse with
spot beams. Multiple beams.

Satellite front end, Front-end noise. Noise temperature Front end filters.

Satellite multiple access methods, FDMA. TDMA, CDMA Systems, DS-CDMA and
frequency hopped CDMA, Satellite jamming, Code acquisition and tracking.

Satellite applications. Data Communication and VSAT network. Mobile satellite services
(GEO and NONGEO).

Suggested Text Books and References:

1. The Satellite Communication applications handbook. By Brauce. R. Elber1.
- 2 Electronic Communication Systems by Wayne Tomas.
3. Satellite Communication by Robert M. Gagliardi.

(MMW-15) MICROWAVE MEASUREMENTS

Theory paper: 100 Marks

Sessional: 50 Marks

Microwave power measurements Measurement of low, medium and high microwave powers.

Slotted line techniques for VSWR Measurement. Measurement of high VSWR using double minima method. VSWR Measurement using reflectometer techniques.

Impedance Measurement.

Measurement of scattering parameters using network analyzer. Frequency Measurements. Slotted line method and frequency meter.

Measurement of Q for transmission type cavity. Antenna Measurement (gain, radiation pattern, impedance) etc.

Dielectric Measurement. swept frequency Measurements.. Measurement using spectrum: analyzer. -

Suggested Text Books and References:

- 1 E.L. Giunzton, "Microwave Measurements", Mc Graw Hill Book Co. Inc. 1957,"
2. SR Adams, "Microwave theory and applications", Prentice Hall Inc. 1969.

(MMW-16) RADAR ENGINEERING

Theory paper: 100 Marks

Sessional: 50 Marks

Prediction of range performance, Minimum Detectable signal, Receiver Noise, Probability.

Density function, signal to noise ratio, cross section of target, cross section fluctuation, pulse repetition freq and range ambiguities.

CW and freq Modulated radar, MTI, Pulse Doppler radar. Tracking radar phased array radar, synthetic aperture radar, Air surveillance radar, millimeter wave, laser radars.

Radar Transmitter power, Various transmitter tubes and their characteristics, modulators, Line type modulator, hard tube modulator solid state transmitter.

Radar Antenna: Antenna parameters, Antenna Radiation pattern, Aperture distribution Pattern synthesis, effects of errors on radiation pattern, stabilization of antenna parabolic reflector antenna, Scanning feed reflector antenna, lens antenna, electronically steered phased array antenna

Detection of Radar signal in Noise, detection criteria, matched filter receiver, correlation detection, detector characteristics, ECM (Electromagnetic Compatibility), ECCM

(Electronic Counter- Counter measurement) CFAR (Constant False Alarm Rate)

Receiver, Radar Signal design and corresponding receiver design, Millimeter wave radar,

Suggested Text Books and References:

1. Introduction to Radar Systems: M. I. Skolnik
2. Radar Handbook: M.I. Skolnik.

(iii) CRYPTOGRAPHY AND DATA SECURITY

Internet and Communication Protocol, A brief history of Internet OSI TCPIP, the need for tunneling and encryption keys, Tunneling, Internet Protocol security.

Deterring Needs - The evaluation of security assessments, assessing needs in house, the management role, web access question. Containers network bulnerality detection, penetration testing internal security needs.

Structured query language security and other specialties.

Trends in Internet crime. Denial of service attack, tools, that works for and agmust the Network, IP Spoofing attade the Telnet hole, Language vulnerabilities. Other-Java and Active X, Unix root control, Trojan Hares.

Virtual private network, Fire walls and disaster recovery planning, Security tools.

Different encryption & decryption algorithm concept of private & Public keys.

Suggested Text Books and References:

1. Introduction to cryptography- H Delfs H. Knebl - 2002 Springer.
2. Introduction to cryptography - J.A. Buchamann - 2001 Springer.
3. Information Security & Cryptography - ICISC 2001, K Kim Ed 2002 vol. 2288 Springer.
4. Understanding data comm.. & networks - Shay - Vikas Thomas Pub.-
5. Information security & Cryptography - ICISC 2000 by D. Won. Vol 2015 ec 2001 Springer (lect notes).

(MMW-01) COMPUTATIONAL METHOD FOR ELECTROMAGNETICS

Theory paper: 100 Marks

Sessional: 50 Marks

Solution of linear simultaneous and transcendental equation, Eigen values problems, Iterative method. Jacobi's method, and solution of electromagnetic problem.

Analytical method separation of variables orthogonal functions, series expansion, boundary value problems some practical application of electromagnetic.

Numerical integration, Euler's rule, Trapezoidal rule, Simpson rule, Newton Cote's method, Newton - Raphson method and Gaussian Quadrature method, Finite Element method solution of poisson and wave equation and other electromagnetics problems.

Basic MATLAB function and application. Fuzzy Set Theory and Application to Microwave

problems, fuzzy MAT LAB tools.

Finite element, Effective dielectric constant, mode matching other analytical tools for solving field problems.

Suggested Text Books and References:

- 1 . Numerical methods in science & engineering, Dr. M.K Venkataraman, The National Pub. Co. 1991.
2. Computer Oriented statistical and numerical methods, B. Balaguru Swamy, Macmillan India Ltd. 1998
3. Numerical methods for scientific and engineering computation, M.K Jain, S. R. K yengar and R, K. Jain, Wiley Eastern lid, 1987
4. Communication Systems, S Haykins, John Wiley and Sons

(MMW-11) OPTICAL COMMUNICATION

Theory paper: 100 Marks

Sessional: 50 Marks

Introduction To optical communication, principles of light Transmission, optical fiber modes and configurations, Mode theory for circular wave-guides, Single mode fibers multi-mode fibers, Numerical Aperture, Mode field Diameter, V-number, Fiber materials, Fiber fabrication Techniques.

Optical Sources, LED'S LASER Diodes, Modal reflection Noise, Power launching and coupling, population Inversion, Fiber splicing, optical connectors, Photodetectors, PIN, Avalanche, Detector Response Time, Avalanche Multiplication Noise.

Signal Degradation in optical fibers, attenuation, losses, Signal distortion in optical waveguide, Material Dispersion waveguide Dispersion, chromatic Dispersion, Intermodol Distortion, pulse broadening in graded index fiber, Mode coupling, Advance fiber designs:

Dispersion shifted, Dispersion flattened, Dispersion Compensating fiber, Design optimization of single mode fibers. .

Coherent optical fiber communication, modulation techniques for Homodyne and Heterodyne systems. Optical fiber link design: Rise Time Budget and Link Power Budget,

Long - Haul Systems. Bit error rate, Line coding NRZ, RZ Block codes, Eye pattern.

Advance Systems and Techniques, Wavelength Division Multiplexing, opt~1 Amplifiers: Semi conductor Amplifier, EDFA, optical Amplifier: Gain, Bandwidth: Photonic Switching, Optical Networks: Optical fiber Bus, Ring Topology, STAR Architectures, FDDI, SONET.

Suggested Text Books and References:

1. DF. Mynbacv and L Scheiner "Fiber Optic Communication Technology", Pearson Elocution.

i 2. G. Keiser "Optical Fiber Communication (3rd Edition)", McGraw Hill International

~ 3. A. Ghatak and K Thyagrajan, "Int. To Fiber Optics", Cambridge Univ. Press.

ELECTIVE II

Theory paper: 100 Marks
Sessional: 25 Marks

(i) VLSI DESIGN

Review of logic design fundamentals - Combinational logic. K- maps. designing with NAND and NOR gates. Hazards in combinational networks. mealy sequential n/w design. Moore sequential n/w. Synchronous design. m/c design.

Introduction to VHDL-VHDL description & combinational N/W. modeling flip flops multiplexes using VHDL Processes. Compilation & simulation of VHDL Code. modelling a sequential m/c. variables. signals & constants. Arrays. VHDL operators. . functions & procedures. packages and libraries.

Attributes. Multivalued logic and signal resolution. IEEE 1164 standard logics.

Generics. Generate statements. synthesis of VHDL code, synthesis examples, files & TEXTIO.

Designing with programmable logic del/ices ROM, PLA'S. PAL'S. PLD'S..

designing with programmable gate arrays. FPGA'S. CPLD'S (Complex programmable logic devices).

Floating point arithmetic - Multiplication & other operation.

Hardware testing and Design - Combinational logic testing. sequential logic testing, scan testing. boundary scan . built in self test

Design Examples & Case studies - USART design. micro controller design, design of~ micro controller CPU . filter design etc.

Suggested Text Books and References:

1. VHDL Primer - Bhaskar.m PHI. 3rd Edition. 1999.
- 2 Digital system design using VHDL- Charles Roth -Thomson. 2nd Edition 2001.
3. Modern VLSI design (System on Silicon) - Wayne waif. Pearson education Asia 2nd Edition 2000

(ii) MICROWAVE COMMUNICATION

Microwave radio system: Transmitter & receivers block diagram. FM microwave repeater. diversity protection switching microwave terminal station, repeater station
Microwave links: Block diagram. path characteristics, system gain, free space path loss, SIN ratio.

Microwave sources: Vacuum tube & solid state devices. microwave modulators
microwave amplifiers, transmitting & receiving antennas, microwave detectors.

Microwave components: waveguide, joints. Tees. frequency meters, attenuators, ferrite devices. direction couplers etc.

Suggested Text Books and References:

1. Advanced Electronic Comm System W Tomasi. PHI. 1988
- 2 Electronic Comm Systems II Edition Roy Blake Thomsar
3. Electronic Cornm. Kemealy & Dakis TMH.

ELECTIVE II
(i) MOBILE COMMUNICATIONS

Theory paper: 100 Marks

Sessional: 25 Marks

An overview of wireless communication systems First generation analog cellular systems, second generation digital cellular systems, third generation systems standards for wireless communications systems. GSM, IMT -2000, UMTS Mobile Satellite Communication - GEO. LEO. MEO, Terrestrial mobile system.
Cellular communication fundamentals Cellular systems. Geometry of a Hexagonal Cell Cochannel interference ratio. Cellular system design in worst case with an omnidirectional antenna, cochannel interference reduction with use of directional antenna Cell splitting. Frequency and spectrum management and handoffs Access Techniques. GSM architecture and interfaces. GSM frequency bands, GSM PLMN, GSM PLMN Services, GSM interfaces. The Radio interface MS to BTS. Abis interface (BTS to MSC). Interface BSC to MSC. .
Radio Propagation and cellular engineering concept. Propagation characteristics. Multipath faded radio signals. Radio link design Receiver sensitivity and link budget. Data services in GSM. GSM GPRS. Privacy and security in GSM

Suggested Text Books and References:

1. Wireless Digital Communication- Feher 1991, PHI.
 2. Principles & applications of GSM - Vijay K. Garg, and J.E. Wilkes 1999 Prentice hall PTR
 3. Telecom Transmission handbook 4th ed Roger L Freeman 1998 John Wiley & Sons. Inc New York -I
- ' Mobile Cellular Telecomm. Lee 1995 Mc Graw Hillinc .

(ii) INTERNET & INTRANET

Development of Internet, Designing principles of Internet, Internetworking architecture
Internetworking issues.

Network layer structure, Internet protocol standards, Internet IP. Ipv6 The ISO Internet
protocol, ISO routing protocols.

The world wide web: Web fundamentals, URL , Web protocols- HTTP. SSL , Services
HTTP other web tools, FTP, HTML. Java. VRML. Jargon IRC. WAIS.

Net components: Internet terminology, provider. client & browser, services, viewers.

Gateway and Routers

Net applications: e mail, Netnews, Telnet, e commerce Network security firewalls.

Digital Signature.

Intranet and exlranet.

Suggested Text Books and References:

1. Data Communication. Computer Network and Open system: F Halshal, Addison
Wesley.
2. Internetworking with TCP/IP: Volume I: Comer, PHI.
3. Launching Business on the Web: David Cook. PHI

(iii) DIGITAL SIGNAL PROCESSING

Discrete Time signals - sequences, Discrete Time Systems, LTI systems, Frequency Domain Representation of Discrete Time Signal, Constant - Coefficient Difference equation. Z - Transform Properties, R. O.C. Inverse Z- Transform Recursive & Non Recursive System.

D.F. T. - Properties, Linear & Circular Convolution. I.D.F. T - **Computation of D.F. T:** FFT-

Decimation in Time & Decimation in Frequency.

I.I.R systems: Basic structure of FIR & IIR, Bilinear Transformation. Design of Discrete

Time IIR. filters - Butterworth, chebychev, Inv. Chebychev. Elliptic etc Using MATLAB.

F.I.R. Systems :- Design of F.I.R. filter by windowing - Rectangular. Bartlett. Hann. Hamming. kaiser window filter design method. relationship of Kaiser to other windows. Application of MATLAB for Design of Digital Filters, Effect of Finite Register Length in Filter Design

Suggested Text Books and References:

1 A V Oppenheim and R. W. Schaffer, "Discrete Time signal Processing (2nd edition)". Prentice Hall, 1999

2. S.Mitra "Digital Signal Processing A computer based approach", TATA Mc Graw Hill 1998.

~; 3. Proakis. "Introduction to Digital Signal Processing" Maxwell Mcmillan. International Cc Edition 1989.

(MMW-02) DIGITAL COMMUNICATION AND CODING

Theory paper: 100 Marks

Sessional: 50 Marks

Sampling Theorem, PAM, TOM. PCM, OM, ADM, DPCM, Systems.

Digital Modulation, ASK, FSK, PSK, BPSK, QPSK, M-ary PSK Systems.

Entropy, Information Rate, Mutual Information, Channel Capacity, Shannon's Theorem, Shannon Hartley Theorem.

Source coding, Shannon - Fano code, Huffman code, Channel Coding, Hamming's SEC Block code, Convolutional Code, Cyclic Code.

Suggested Text Books and References:

1. Digital & Analog Comm. Systems. K.Sam . Shanmugham John wiley
2. Communication Systems R.P.Singh & S.D.Sapre, TMH, 1995.
3. Principles of Comm Systems' Taub & Schilling, Mc GramHili.

(MMW-03) MICROWAVE THEORY AND TECHNIQUES

Theory paper: 100 Marks

Sessional: 50 Marks

Characteristics features of microwaves, applications of microwaves, Maxwell's equations,

plane wave in dielectric and conducting media, waveguide analysis, VSWR, and impedance, waveguide discontinuities.

Microwave Network Representations: S-matrix representations, matrices of some typical microwave components such as attenuator, matched load, powerdivider, directional coupler, magic tee etc.

Ferrite devices, wave propagation in ferrite medium, faradayrotation, isolator, circulator etc.

Suggested Text Books and References:

1. S.Y. Liao, "Microwave devices & Circuits", Prentice Hall of India, 3rd Ed.. 1995.
- 2, K.C.Gupta, "Microwaves", Wiley Eastern Ltd. 1979.
3. B.R. Vishvakarma. "Electromagnetic fields & applications", NBC international 1998.

(MMW-06) ANTENNA ENGINEERING

Theory paper: 100 Marks

Sessional: 50 Marks

Radiation. retarded potential. radiation field from current element antenna, radiation, power and radiation resistance of short dipoles & half dipole antennas, directivity and gain calculation.

Antenna as an aperture. resonant and traveling wave antenna for different wavelength, antenna arrays. Binomial and Dolph-Chebychev optimum distribution. Image antenna, patterns & principle of pattern multiplication.

Helical antenna. Lens antenna, parabolic reflector frequency independent antenna. Horn antenna.

Moment method and its application to a wire antenna, Hallen's integral equation & its solution. Surface wave, leaky wave & dielectric corrugated antennas.

Suggested Text Books and References:

1. John O Kraus "Antennas" Mc Graw Hill International Edition, Second Edition 1980.
2. Jordan & Balmain "Electromagnetic Waves & Radiating Systems", Prentice Hall India (Ltd.) Second Edition 1971

(MMW-07) MICROWAVE & MILLIMETER WAVE INTEGRATED CIRCUITS
Theory paper: 100 Marks
Sessional: 50 Marks

Analysis of strip lines, microstrip lines, other microstrip like planar transmission lines etc. analysis of slot lines and coplanar guides quasi-static approach and fullwave discontinuities.

Microstrip line characterization of bends & junction. Lumped element in MICs; Technology of hybrid MICs.

Design of MIC components- transitions, couplers, filters, Power dividers, oscillators, modulators, phase shifters & amplifiers

Analysis of basic transmission lines for millimeter wave frequencies-Integrated fin line, insulated image guide, trapped guide, non-radiative guide, groove guide.

Transitions, bends and discontinuities at MM waves Measurement techniques Design of millimeter wave components, couplers, power dividers, filters, oscillators, switches, phase shifters and amplifiers.

Suggested Text Books and References:

1. K.C. Gupta, "Microstripline & Slot lines" Artech House.
2. S.K.Kaul, "Optical & Dielectric waveguide", John Wiley International,2001.

(MMW-10) MICROWAVE DEVICES

Theory paper: 100 Marks

Sessional: 50 Marks

Microwave diodes and circuits, varactor diodes, millimeter wave varactor diodes.
Detailed calculations of varactor characteristics, Manley Rowe power relations, Varactor applications in a Parametric amplifier and up and down converter.
P-I-N diodes. Use of P-I-N diode as a microwave switch. limiters and phase shifters.
Schottky barrier devices: Detector and mixer diode circuits. Tunnel diodes.
Avalanche transit time devices, bulk Gallium Arsenide devices.
Microwave linear beam tubes Klystrons, Reflex Klystron, TWTs Crossed feed tubes-magnetrons backward and forward cross feed amplifiers and oscillators.

Suggested Text Books and References:

- 1 S.Y. LIAO "Microwave devices and circuits", Englewood Cliffs, NJ Prentice Hall 1980.
2. Edited by H.A. Watson, "Microwave Semiconductor devices and their circuit applications", Mc Graw Hill Book Co. New York 1969.
3. Coleman J.T., "Microwave Devices", Pesto Va Reston 1982