ANNA UNIVERSITY TIRUCHIRAPPALLI
Tiruchirappalli – 620 024
Regulations 2008
Curriculum

M.E. OPTICAL COMMUNICATION

SEMESTER I

S.No.	Subject Code	Subject	L	T	P	C
Theory						
1	**MA5131**	Applied Mathematics for Electronics Engineers	3	1	0	4
2	**OC5101**	Fiber Optic Sensors and Devices	3	0	0	3
3	**OC5102**	Optical Fiber Communication	3	0	0	3
4	**OC5103**	Optical Fiber Technology and Applications	3	0	0	3
5	**CO5102**	Modern Digital Communication Techniques	3	0	0	3
6	**E1******	Elective I	3	0	0	3
Practical						
7	**OC5104**	Optical Communication Laboratory I	0	0	4	3
					Total	**22**

SEMESTER II

S.No.	Subject Code	Subject	L	T	P	C
Theory						
1	**OC5151**	Integrated Optics	3	0	0	3
2	**OC5152**	Optical Computing	3	0	0	3
3	**OC5153**	Optical Imaging Techniques	3	0	0	3
4	**OC5154**	Optical Signal Processing	3	0	0	3
5	**E2******	Elective II	3	0	0	3
6	**E3******	Elective III	3	0	0	3
Practical						
7	**OC5155**	Optical Communication Laboratory II	0	0	4	3
					Total	**21**

SEMESTER III

S.No.	Subject Code	Subject	L	T	P	C
Theory						
1	**E4******	Elective IV	3	0	0	3
2	**E5******	Elective V	3	0	0	3
3	**E6******	Elective VI	3	0	0	3
Practical						
4	**OC5251**	Project Work Phase I	0	0	12	6
					Total	**15**

SEMESTER IV

S.No.	Subject Code	Subject	L	T	P	C
Practical						
1	**OC5251**	Project Work Phase II	0	0	24	12
					Total	**12**

Total Credits to be Earned for the Award of the Degree = 70

LIST OF ELECTIVES

S.No.	Subject Code	Subject	L	T	P	C
Theory						
1	**OC5001**	ISDN Architecture	3	0	0	3
2	**OC5002**	Network Management	3	0	0	3
3	**OC5003**	Non Linear Fiber Optics	3	0	0	3
4	**OC5004**	High Speed Photonics and Optoelectronics	3	0	0	3
5	**OC5005**	Photonics Switching	3	0	0	3
6	**OC5006**	Laser Satellite Communication	3	0	0	3
7	**OC5007**	Laser Holographic Techniques	3	0	0	3
8	**OC5008**	Laser and its Applications	3	0	0	3
9	**OC5009**	Soliton in Optical Communication	3	0	0	3
10	**AN5101**	Advanced Digital Signal Processing	3	1	0	4
11	**AN5001**	Digital Image Processing	3	0	0	3
12	**AN5006**	Design and Analysis of Algorithms	3	0	0	3
13	**AN5008**	Internetworking Multimedia	3	0	0	3
14	**AN5009**	Electromagnetic Interference and Compatibility in System Design	3	0	0	3
15	**AN5010**	High Performance Communication Networks	3	0	0	3
16	**CO5103**	Optical Communication Networks	3	0	0	3
17	**CO5001**	RF System Design	3	0	0	3

ANNA UNIVERSITY TIRUCHIRAPPALLI
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Regulations 2008

Sylllabus

M.E. OPTICAL COMMUNICATION

SEMESTER I

MA5131 – APPLIED MATHEMATICS FOR ELECTRONICS ENGINEERS

L	T	P	C
3	1	0	4

UNIT I LINEAR ALGEBRAIC EQUATIONS & EIGEN VALUE PROBLEMS 9

System of Equations – Solutions by Gauss Elimination Methods – Gauss Jordan and LU Decomposition Method Jacobi – Gauss Seidel Method – Eigen Values of Matrix by Jacobi and Power Method.

UNIT II THE WAVE EQUATIONS 9

Solution of Initial and Boundary Value Problems – Characteristics–D'Alembert's Solution– Significance of Characteristic Curves – Laplace Transform Solutions – for Displacement in a Long String – A long String under its Weight – Longitudinal Vibration of a Elastic Bar with Prescribed Force on one end – Free Vibrations of a String .

UNIT III SPECIAL FUNCTIONS 9

Bessel's Equation – Bessel Functions Legendre's Equation – Legendre Polynomials Rodrigue's Formula – Recurrence Relations – Generating Functions and Orthogonal Property for Bessel Functions – Legendre Polynomials.

UNIT IV RANDOM VARIABLES 9

One–Dimensional Random Variables – Moments and Moment Generating Function –Binomial Poisson– Uniform – Exponential Normal and Weibull Distribution – Two Dimensional Random Variables Marginal and Conditional Distribution Covariance – Correlation Coefficient – Function of One Dimensional and Two Dimensional Random Variables.

UNIT V QUEUING THEORY 9

Single and Multiple Server Markovian Queuing Models – Steady State System Size Probabilities– Little's Formula – Customer Impatience Priority Queues – M/G/1 Queuing System – PK Formula .

L: 45 T: 15 Total: 60

TEXT BOOKS

1. S. Narayanan T. K. Manichvachagam Pillay and G. Ramanaiah, "Advanced Mathematics for Engineering Students", S.Viswanathan Pvt Ltd, Vol 2, 1986.
2. Taha H. A., "Operations Research An Introduction", Sixth Edition, PHI, 1997.

REFERENCES

1. Sankara Rao K, "Introduction to Partial Differential Equation", PHI, 1995.
2. Churchi R. V., "Operational Mathematics", McGraw Hill, 1972.
3. Richard A. Johnson, "Miller and Freund's Probability and Statistics for Engineers", Fifth Edition, PHI, 1994.

OC5101 – FIBER OPTIC SENSORS AND DEVICES

L	T	P	C
3	0	0	3

UNIT I OPTOELECTRONIC DEVICES 9

Electroptic modulators – Magneto optic devices – Accoustoptic devices – Photo detectors – Thermal Detectors – Photon Devices – Photo conductors – Photo diodes – Detector Arrays – Optical switching and Logic Devices.

UNIT II FIBERS AND MODULATED SENSORS 9

Principles of glass and plastic fibers for sensing application – Electro–optic modulation – Bulk and integrated optic types – All fiber modulators – Interferometric Sensors – Fabry perot – Mach Zender – Michelson and Sagnac interferometric sensors.

UNIT III MULTIMODE GRATING AND POLARISATION SENSORS 9

Sensors based on relative movements of opposite gratings – sensors based on grating period modulation – Photo elastic effects – retardation plates

UNIT IV DISTRIBUTED AND MULTIPLEXED FIBER OPTIC SENSORS 9

Basic Concepts – Distributed sensing – Principles of sensor multiplexing – Topology – Detection schemes – Interferometer sensor multiplexing – Faraday Effect sensors – Magneto strictive and Lorentz force sensors.

UNIT V INDUSTRIAL APPLICATIONS AND SMART STRUCTURES 9

Temperature – Pressure – fluid level – flow position – vibration and rotation measurements – chemical analysis – Current and voltage measurement – Introduction to smart structures – Application of fiber optic smart structures and skins – Examples.

Total: 45

TEXT BOOKS

1. B.Chulshaw and J.Daykin, “Optic fiber sensors Systems and Application”, Vol. l & ll, Artech House, Norwood, 1989.
2. Eric Udd, “Fiber Optic Sensors”, John Wiley, Newyork, 1991.

REFERENCES

1. Eric Udd, “Fiber Optic Smart structures”, John Wiley, 1995.
2. B.P.Pal, “Fiber Optics in Telecommunication and sensor”, Wiley Eastern, 1995.
3. F.Allard, “Fiber Optics Hand Book”, McGraw Hill, Newyork, 1990.
4. J.Wilson and J.Haukes, “Opto Electronics - An Introduction”, Prentice Hall of India, 1995.
5. Bhattacharya, “Semiconductor Opto Electronics devices”, Printice Hall of India., 1995.

OC5102 – OPTICAL FIBER COMMUNICATION

L	T	P	C
3	0	0	3

UNIT I OPTICAL FIBERS 9

Geometrical description – wave propagation – Dispersion in single mode (SM) and multimode (MM) fibers – Limitations due to dispersion – Fiber Losses – Non liner optical effects.

UNIT II OPTICAL AMPLIFIERS 9

Concepts – Semiconductor optical Amplifier – Raman and Brillouin amplifier – Fiber amplifiers – Erbium doped amplifiers – System applications

UNIT III DISPERSION MANAGEMENT 9

Need – Precompensation schemes – Postcompensation techniques – Dispersion compensating fibers – Optical filters – Fiber Bragg gratings – Optical Phase Conjugation – Long Haul lightwave systems – High capacity systems.

UNIT IV MULTICHANNEL SYSTEMS 9

WDM lightwave systems – WDM components – System performance issues – Time Division Multiplexing (TDM) – Sub carrier multiplexing – Code Division Multiplexing – DWDM.

UNIT IV COHERENT LIGHTWAVE SYSTEMS 9

Concepts – Modulation formats – Demodulation formats – Bit Error Rate (BER) – Sensitivity degradation – System performance.

Total: 45

TEXT BOOKS

1. G.P. Agrawal, “Fiber optic communication systems”, 3nd Ed - John Wiley & Sons, 2002.
2. G. Keiser, “Optical fiber communication systems”, McGraw - Hill , 3rd Editions,2000.

REFERENCES

1. H. Franz & V.K.Jain, “Optical Communication Systems”, Narosa Publications, 1995.
2. H. Franz & V.K. Jain,“Optical communication - Components and Systems”, Narosa Publications, 2002.
3. Selvarajan - S. Kar and T. Srinivas , “Optical fiber Communication - Principle and Systems”, Tata McGraw -Hill, 2002.

OC1603 – OPTICAL FIBER TECHNOLOGY AND APPLICATIONS

L	T	P	C
3	0	0	3

UNIT I PROPERTIES OF FIBER 9

Physical – Mechanical and Optical properties of fiber – Material selection – properties of materials.

UNIT II MANUFACTURING TECHNOLOGY 9

Fiber drawing – Mutlicomponent technology – Vapour deposition techniques: IVD – OVD and CVD – VAD – MOCVD processes – Performance comparison.

UNIT III FIBER PARAMETER MEASUREMENTS 9

Measurement of fiber parameters: NA – Modefield diameter – profile – attenuation – bandwith, signal degradations in fiber – Dispersion – Birefringence and propagation constant of fiber modes – OTDR and OFDR.

UNIT IV FIBER CABLES DESIGN 9

Design conditions: Loss mechanism, mechanical design – standard fibers – design of strength member – sheaths – Fiber core construction – Ribbon cable – stranding cable – loose tube cable – V–groove cables – Submarine cables – armored and unarmored cables.

UNIT V FIBER OPTIC COUPLERS 9

Single mode and multimode couplers – Transmission and reflection type couplers – Active couplers – □□ couplers – switches – modulators.

Total: 45

REFERENCES

1. K.C.Kao, “Optical Fiber Technology and Applications”, McGraw-Hill, 1989.
2. Hiroshi Murata, “Handbook of Optical Fibers and Cables”,Marcel Dekker Inc., 1998.
3. Tamir.T, “Guided wave Optoelectronics”, Springer Varlag, Berlin, 1992.
4. Gred Keiser, “Optical Communication”, 3rd Edition, McGraw-Hill, 2000.
5. John Gowar, “Optical Communication System”, Prentice Hall, 1995.
6. Mahlke Gunther, and Goessing Peter, “Fiber optic cables: Fundamentals, Cable Engineering, System planning”, 3rd edition, John Wiley, 1997.

CO5102 – MODERN DIGITAL COMMUNICATION TECHNIQUES

L	T	P	C
3	0	0	3

UNIT I POWER SPECTRUM AND COMMUNICATION OVER MEMORYLESS CHANNEL 9

PSD of a synchronous data pulse stream M – ary Markov source Convolutionaly coded modulation Continuous phase modulation – Scalar and vector communication over memoryless channel – Detection criteria.

UNIT II COHERENT AND NON –COHERENT COMMUNICATION 9

Coherent receivers – Optimum receivers in WGN – IQ modulation & demodulation – Noncoherent receivers in random phase channels M – FSK receivers – Rayleigh and Rician channels – Partially coherent receives – DPSK M – PSK M – DPSK – – BER Performance Analysis.

UNIT III BANDLIMITED CHANNELS AND DIGITAL MODULATIONS 9

Eye pattern demodulation in the presence of ISI and AWGN Equalization techniques – IQ modulations QPSK QAM QBOM – BER Performance Analysis – Continuous phase modulation CPFM CPFSK MSK – OFDM.

UNIT IV BLOCK CODED DIGITAL COMMUNICATION 9

Architecture and performance – Binary block codes Orthogonal Biorthogonal Transorthogonal – Shannon's channel coding theorem Channel capacity Matched filter Concepts of Spread spectrum communication – Coded BPSK and DPSK demodulators – Linear block codes Hammning Golay Cyclic BCH Reed – Solomon codes.

UNIT V CONVOLUTIONAL CODED DIGITAL COMMUNICATION 9

Representation of codes using Polynomial – State diagram – Tree diagram – and Trellis diagram – Decoding techniques using Maximum likelihood – Viterbi algorithm – Sequential and Threshold methods – Error probability performance for BPSK and Viterbi algorithm – Turbo Coding.

Total: 45

TEXT BOOKS

1. M.K.Simon - S.M.Hinedi and W.C.Lindsey, "Digital communication techniques Signalling and detection", Prentice Hall India ,1995.
2. Wayne Tomasi, "Advanced electronic communication systems", 4th Edition, Pearson Education Asia, 1998.

REFERENCES

1. Simon Haykin, "Digital communications", John Wiley and sons, 1998.
2. B.P.Lathi, "Modern digital and analog communication systems", 3rd Edition, Oxford University press, 1998.

OC5104 – OPTICAL COMMUNICATION LABORATORY I

L	T	P	C
0	0	4	3

1. Simulation of Modulation and Coding in a AWGN Communication Channel using Simulation Packages.
2. Performance evaluation of Digital Data Transmission through Fiber Optic Link
3. Characterization of Glass /Plastic Optical Fibers.
4. P –I Characteristics of LED and LASER Diode.
5. DC Characteristics of PIN PD and APD.
6. System Bandwidth determination for Analog Fiber Link.
7. Optical Link Simulation using Simulation Packages.
8. Optical Device Modeling using SPICE

OC5151 – INTEGRATED OPTICS

L	T	P	C
3	0	0	3

UNIT I OPTICAL MODES 9

Advantages of Integrated Optics – Substrate Materials for Optical Integrated Circuits – Optical Waveguide modes – Modes in a Planar Waveguide structure – Ray Optic approach to Optical Mode theory – theory of Optical Waveguides.

UNIT II OPTICAL WAVEGUIDES 9

Waveguide fabrication techniques – Polymer and Fiber Integrated Optics – Losses in Waveguides – Waveguide Input and Output Couplers – Coupling between waveguides.

UNIT III OPTICAL INTEGRATED CIRCUIT 9

Microfabrication techniques in optical integrated circuits – Pattern fabrication – passive waveguide devices – Functional devices.

UNIT IV SEMICONDUCTOR INTEGRATED OPTIC DEVICES 9

Basic principles of Light Emission in Semiconductors – Semiconductor Lasers – Heterostructure – Confined Lasers – DFB Lasers – Direct modulation of Semiconductor lasers – Quantum well Devices – Micro optic Electromechanical Devices.

UNIT V APPLICATIONS OF OPTICAL INTEGRATED CIRCUITS 9

Application of OI circuits – Optoelectronic IC – Optical switches – convolvers and correlators – Devices & systems for Telecommunications – Photonic and Microwave Wireless Systems.

Total: 45

TEXT BOOKS

1. Hiroshi Nishihara, Masamitsu Haruna, Toshiaki Suhara, "Optical Integrated Circuits - McGraw - Hill, New York, 1992.
2. Robert .G. Hunsperger, "Integrated Optics - Springer", 5th Edition, Verlag New York, 2002.

OC5152 – OPTICAL COMPUTING

L	T	P	C
3	0	0	3

UNIT I BASICS OF OPTICAL COMPUTING 9

Sources – Basic elements of Optical System – Acousto – Optic System – Limitations – Detectors – Holographic techniques

UNIT II OPTICAL IMAGING AND NUMERICAL PROCESSING 9

Spectral analysis and filtering – Pattern Recognition – Picture Deblurring – Synthetic Aperture Radar Imaging – Transforms – Simple Arithmetic – Matrix Operations – Differentiation and Integration.

UNIT III ANALOG OPTICAL COMPUTING 9

Linear optic processing – Analog optical arithmetic – Recognition by analog optical system.

UNIT IV DIGITAL LOGIC 9

Logic elements and Operations – Combinational Logic – Sequential Logic.

UNIT V DIGITAL OPTICAL COMPUTING 9

Devices – Shadow casting – Symbolic substitution – Optical matrix processing.

Total: 45

TEXT BOOKS

1. Karim Mohammed and A.S. Abdul Awwall, “Optical computing - An introduction”, John Wiley , New York, 1992.
2. Dror Feitelsen, “Optical Computing”, MIT press, Cambridge, 1988.

OC5153 – OPTICAL IMAGING TECHNIQUES

L	T	P	C
3	0	0	3

UNIT I FUNDAMENTALS 9

Coherance and light source – optical image formation – Franhoufer diffraction – Single slit – double slit circular aperture – double aperture gratings – 1D and 2D lens aperture – Interference.

UNIT II FOURIER SERIES AND TRANSFORM 9

Fourier series – Fourier coefficients – optical and crystal diffraction gratings – Fourier series formulation – Fourier transform and single slit diffraction – grating pattern – Fourier transform of light waves – correlation.

UNIT III OPTICAL IMAGING AND PROCESSING 9

Incoherent optical imaging – transfer function – coherent optical imaging – periodic and non periodic objects – optical transform – Holography – coherent and incoherent optical processing.

UNIT IV IMAGE CONSTRUCTION TECHNIQUES 9

X – ray computed tomography – reconstruction by simple back projection – iterative reconstruction – analysis methods – magnetic resonance imaging – Ultrasonic computed tomography.

UNIT V APPLICATIONS 9

Michelsons stellar interferometry – spectral interferometer – fringe visibility and spectral distribution – partial coherence and correlation – Fourier transform spectroscopy – Synthetic aperture radar – Intensity interferometer – Imaging by holographic techniques.

Total: 45

TEXT BOOKS

1. E.G. Stewart, “Fourier Optics an Introduction”, 2nd Edition, Ellis Harwood limited, Chichester, 1987.
2. Dror.G. Feitelson, “Optical Computing”, MIT press, Cambridge, 1988.

OC5154 – OPTICAL SIGNAL PROCESSING

L	T	P	C
3	0	0	3

UNIT I BASIC SIGNAL PARAMETERS 9

Characterisation – Sample function – geometrical optics – basic laws – refraction by prisms – lens formula – imaging condition – optical invariants – physical optics – Transforms: Fresnel – Fourier – Inverse Fourier and Extended Fourier.

UNIT II SPECTRAL ANALYSIS 9

Spatial light modulation – spatial light modulators – detection process – system performance process – dynamic range – raster format – spectral analysis.

UNIT III SPATIAL FILTERING AND FILTERING SYSTEM 9

Types of spatial filters – optical signal processing and filter generation – read out module – orientation and sequential search – applications of optical spatial filter.

UNIT IV ACOUSTO – OPTIC DEVICES AND POWER SPECTRUM ANALYSIS 9

Acousto – optic cells – spatial light modulators – Raman – Nath and Bragg mode – basic spectrum analyzer – aperture weighting – dynamic range and SNR – photo detector – geometric considerations – radiometer.

UNIT V HOMODYNE AND HETERODYNE SPECTRUM ANALYSERS 9

Overlapping of waves – photo detector size – optimum photo detector size for 1D and 2D structure – Optical radio – spatial and temporal frequencies. Distributed and local oscillator. Dynamic range comparison of heterodyne and power spectrum analyzers.

Total: 45

TEXT BOOKS

1. Vanderlught, “Optical Signal Processing”, John Wiley & Sons, 1992.
2. P.K. Das, “Optical Signal Processing Fundamentals”, Narosa Publishing, 1991.

REFERENCE

1. Bradley G. Boone, “Signal Processing using optics”, Oxford University Press, 1998.

OC5155 – OPTICAL COMMUNICATION LABORATORY II

L	T	P	C
0	0	4	3

1. Study of spatial light modulator
2. Response of optical filters
3. Characteristics of optical switches
4. Optical convolution
5. Optical matrix multiplication
6. Study of Machzender interferometer

LIST OF ELECTIVES

OC5001 – ISDN ARCHITECTURE

L	T	P	C
3	0	0	3

UNIT I ISDN **9**

ISDN – Conceptual View of ISDN – ISDN Standards – transmission structure – User – Network interface configuration – ISDN protocol architecture – ISDN Connection – Addressing – Internetworking.

UNIT II ISDN LAYERS **9**

User network interface – Primary rate user – Network interface – U interface – LAPD –Terminal adaption – Channel DLC using I.465/V.120.

UNIT III ISDN SERVICES **9**

Basic cell control – Supplementary services – service capabilities – Bearer services –teleservices – SS7 architecture – Simulation link level – Simulation network level.

UNIT IV FRAME RELAY **9**

Frame mode protocol architecture – frame mode call control – LAPF – congestion in frame relay – approaches traffic rate management – congestion avoidance.

UNIT V BISDN ARCHITECTURE **9**

BISDN Standard – Broadband services – B – ISDN Protocol – Reference model – BISDN physical layer – SONET/SDH – ATM protocol – Traffic management and congestion control in ATM networks.

Total: 45

TEXT BOOKS

1. Alberto Leon Garcia and Indra Widjaja, "Communication Networks - fundamentals Concepts and Key Architecture", TMH, 2001.
2. Sumit Kesara and Pankaj sethi, "ATM Networks - Concepts and Protocols", TMH, 2002.

REFERENCES

1. William Stallings, "ISDN and Broad band ISDN with frame relay and ATM", 4th Edition, Pearson Education, 2001.
2. Rajiv Ramasamy and Kumar N. Sivarajan, "Optical Networks - a Practical perspective", 2nd Edition, Morgan Kaufmann Publishers, 2002.

OC5002 – NETWORK MANAGEMENT

L	T	P	C
3	0	0	3

UNIT I FUNDAMENTALS OF COMPUTER NETWORK TEHNOLOGY 9

Network Topology – LAN – Network node components Hubs – Bridges – Routers –Gateways – Switches – WAN – ISDN Transmission Technology – Communications protocols and standards.

UNIT II OSI NETWORK MANAGEMENT 9

OSI Network management model – Organizational model – Information model –communication model – Abstract Syntax Notation – Encoding structure – Macros Functional model CMIP/CMIS.

UNIT III INTERNET MANAGEMENT (SNMP) 9

SNMP – Organizational model – System Overview – The information model – communication model – Functional model – SNMP proxy server – Management information – protocol remote monitoring.

UNIT IV BROADBAND NETWORK MANAGEMENT 9

Broadband networks and services – ATM Technology – VP – VC – ATM Packet –Intergrated service – ATMLAN emulation – Virtual Lan. ATM Network Management –ATM Network reference model – Intergrated local management Interface. ATM Management Information base – Role of SNMD and ILMIin ATM Management – M1 – M2 – M3 – M4 Interface. ATM Digital Exchange Interface Management.

UNIT V NETWORK MANAGEMENT APPLICATIONS 9

Configuration management – Fault management – performance management – Event Correlation Techniques – security Management – Accounting management – Report Management – Policy Based Management Service Level Management

Total: 45

TEXT BOOKS

1. Mani Subramanian, “Network Management Principles and practice”, Addison Wesly, 2000.
2. Salah Aiidarous, Thomas Plevayk, “Telecommunications Network Management Technologies and Implementations”, Eastern Economy Edition IEEE press, 1998.

REFERENCE

1. Lakshmi G. Raman, “Fundamentals of Telecommunication Network Management”, Eastern Economy Edition IEEE Press, 1999.

OC5003 – NON LINEAR FIBER OPTICS

L	T	P	C
3	0	0	3

UNIT I GROUP VELOCITY DISPERSION 9

Fiber characteristics – Fiber non – linearities – Basic propagation equation – Group velocity dispersion – Different propagation regimes – Dispersion – induced pulse broadening – Higher – order dispersion.

UNIT II NONLINEAR REFRACTION 9

SPM induced spectral broadening – Effect of group velocity dispersion – Higher order nonlinear effects – XPM induced non – linear coupling and modulation instability – spectral and temporal effects.

UNIT III STIMULATED INELASTIC SCATTERING 9

Stimulated Raman Scattering – Raman gain and threshold – Quasi – CW SRS – Ultrashort SRS –

Stimulated Brillouin Scattering: Brillouin gain and threshold – Quasi – CW SBS – Dynamic aspects – Brillouin fiber lasers – SBS applications.

UNIT IV OPTICAL SOLITONS AND POLARIZATION EFFECTS 9

Solitons – Modulation instability – Fiber solitons – other types of solitons – Pertubation of solitons – Nonlinear birefringence and phase shift – Evolution of polarization state – vector modulation instability – Birefringence and solitons.

UNIT V PARAMETRIC PROCESSES 9

Origin and theory of Four – Wave Mixing – Phase – matching techniques – Parametric amplification – FWM applications – Pulse Compression – Physical mechanism – Grating – Fiber Compressors – solution –effect compressors – other compression techniques.

Total: 45

TEXT BOOKS

1. G.P.Agrawal, “Non linear fiber optics”, 3rd Edition, Academic press, 2001.
2. D.L.Mills, “Nonlinear Optics Basic Concepts”, Narosa publishing House, 1991.

REFERENCES

1. G.P.Agrawal, “Applications of nonlinear fiber optics”, Academic press, 2001.
2. E.G.Sauter, “Nonlinear Optics”, Wiley Interscience, 1996.

OC5004 – HIGH SPEED PHOTONICS AND OPTO ELECTRONICS

L	T	P	C
3	0	0	3

UNIT I ELECTRONICS PROPERTIES OF SEMICONDUCTORS 9

Semiconductor materials – Band structure – Band structure modification by alloying – Heterostructure – Intrinsic carrier concentration – Defect levels – excess carriers – recombination process – charge injection and non radiative effects.

UNIT II HIGH SPEED PHENOMENA 9

Picosecond process in carrier transport theory – carrier –carrier interaction – excitation interaction in super lattices – excitation life time reduction – reduction of electrons – photon scattering rates – hot electron diffusion.

UNIT III HIGH SPEED OPTOELECTRONIC DEVICES 9

Mode locked lasers – Fast multiple quantum well absorbers – suppressing of timing and energy fluctuation in lasers – Parametric oscillation in lasers – Ultra fast detectors – metal semiconductor photodiodes – Photoconductors – Switches.

UNIT IV SELF PULSATION AND ULTRA SHORT PULSE GENERATORS 9

Gas switching in semiconductor lasers – Self pulsation in semiconductor laser – bistable laser – Short pulse generation using fiber non – linearity. Period doubling in modulated laser diodes – Optical chaos – Mode locking in laser diodes – Monolithic mode locked laser diodes.

UNIT V APPLICATIONS 9

Application to long distance and high speed communication – High speed optical signal processing – Picosecond electro optic sampling – logic gates – parallel processing and inter connectors.

Total: 45

TEXT BOOKS

1. M.L.Riaziat, “Introduction to high speed electronics and Opto electronics”, John Wiley, 1995.
2. Sueta.T - Okoshi.t, “Fundamental of Ultra fast and Ultra parallel opto electronics”, John Wiley, 1996.

REFERENCE

1. Mourou.G.A, Bloom O.M and Lee. C.H, “Principle electronics and Opto Electronics”, Springer Vering, Berlin, 1995.

OC5005 – PHOTONICS SWITCHING

L	T	P	C
3	0	0	3

UNIT I PHOTONICDEVICES 9

Light sources and laser diodes: semiconductor diode lasers – free electron lasers – Mode locking – Q–switching – pulse shaping – Photo detectors – Optical Amplifiers(SOAs) – Integrated Optical Modulators.

UNIT II OPTICAL SWITCHES 9

Basic 2X2 switch – layered switch designs – blocking – crosstalk – dilation. Optical cross connects. Add Drop Multiplexers – Routing switches – Kerr gates – four – wave mixing gates – directional couplers – Mach – Zehnder interferometer switches – Acoustic optics.

UNIT III OPTICAL SWITCHING 9

Free – space optical switching – optical memory for switching – photonic switch architectures based on TDM – WDM – OCX – ATM.

UNIT IV SOLITON GATES 9

Soliton – dragging logic gates Time domain chirp switch architecture – Soliton – trapping logic gates Soliton ring network.

UNIT V APPLICATIONS OF PHOTONIC SWITCHING 9

High speed data transmission systems – Clock distribution – All optical fiber communication systems – Clock extraction & dispersion compensation – Power mixing & Frequency division switching – Space switches.

Total: 45

TEXT BOOKS

1. Bahaa E.A. Saleh, Malvin Carl Teich, “Fundamentals of Photonics”, 1st Edition, Wiley Interscience, 2002.
2. Mohammed N.Islam, P.L. Knight and A.Miller, “Ultrafast Fiber Switching Devices and Systems”, Cambridge University Press, 1992.

REFERENCE

1. H. Kawaguchi, “Bistabilities and Non - Linearities in Laser Diodes”, Artech house Inc,Norwood, 1994.

OC5006 – LASER SATELLITE COMMUNICATION

L	T	P	C
3	0	0	3

UNIT I FUNDAMENTALS OF LASER COMMUNICATIONS 9

Atmospheric low loss windows – optical sources and detectors for these windows – Characteristics of source and detectors. Optical transmitting and receiving antennas.

UNIT II SYSTEM DESIGN 9

Link equation – Transmitter terminal – Antenna design – Antenna gain – Beam width – C/N – Optical detectors – Optical modulation formats – Deriving error statistics – Signal requirements for acquisition and tracking – Fundamentals of system design.

UNIT III SEMICONDUCTOR AND METAL LASER SOURCES FOR SATELLITE COMMUNICATIONS 9

Performance and Geometries – output wavelength control – Semiconductor laser lifetime – Direct and indirect modulation techniques and radiation effects.

UNIT IV OPTICAL RECEIVERS AND SYSTEM DESIGN 9

Direct detection – coherent detection and demodulation. Gimbals in transceiver design – Receiver options and optics Lasers antennas / Telescope – Internal optical systems – Transmitter analysis.

UNIT V LASER BEAM POINTING CONTROL 9

Acquisition and Tracking systems – System description – Acquisition methodology – racking and pointing control system – RF cross link system design – link equation.

Total: 45

REFERENCES

1. Morris Katzman, “Laser Satellite Communications”, Prentice Hall Inc, New York, 1991.
2. J. Franz and V.K.Jain, “Optical Communication Systems”, Narosa Publication, New Delhi, 1994.

OC5007 – LASER HOLOGRAPHIC TECHNIQUES

L	T	P	C
3	0	0	3

UNIT I OPTICAL HOLOGRAPHY 9

Light wave interference patterns – Diffraction – Hologram formation – wavefront construction – plane and volume hologram – formation geometries – In line and off axis holograms.

UNIT II FOURIERTRANSFORM AND DIFFRACTION 9

Linear space invariant systems – correspondences and transform relations – convolution operation – operational and functional correspondences – Plane waves – Diffraction from periodic objects relation to Fresnel and Kirchhoff integral – Optical systems with spherical lenses.

UNIT III LIGHT SOURCES AND PLANE HOLOGRAMS 9

Light sources for hologram formation – fringe visibility in hologram recoding – illumination with expanded laser beams – division and attenuation of laser beams – stability in hologram formation – light sources for hologram reconstruction – simple holographic techniques. Analysis of plane holograms – Mediums and Geometries.

UNIT IV HOLOGRAM RECORDING MATERIALS 9

Photosensitive materials – exposure sensitivity – resolution – erasability – noise in recording – wavefront reconstruction – ideal materials – exposure characteristics of real materials – Photographic emulsions – gelatin films – thermo plastics – photo chromatic and ferroelectric materials.

UNIT V PULSED LASER HOLOGRAPHY 9

Pulsed laser holograms – recording materials – Non linear recording – Holographic interferometry – information storage – real image applications.

Total: 45

TEXT BOOKS

1. Graham Saxby, “Practical Holography”, Prentice Hall, London, 1988.
2. P.Hariharan, P.L.Knight & A.Miller, “Optical Holography, Principles, Techniques and Applications”, 2nd Edition, Cambridge University press, 1996.

OC5008 – LASER AND ITS APPLICATIONS

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UNIT I LASER THEORY 9

Laser Theory and Principles – Wave Nature of Light – The Interaction of Light with Matter – Atomic Absorption – Energy Levels and Radiative Properties of Molecules – Liquids – Solids and Semiconductors – Radiative Transition and Emission Line Width – optical Resonators – Q Switching and Mode Locking Techniques – Rate Equation.

UNIT II TYPES OF LASERS 9

He – Ne Lasers – Co2 Laser – He – Cd Laser – Ruby Laser – Pulsed Laser – Nd – Yag Laser – Chemical and Dye Laser – Excimer Laser – Nitrogen – Lasers – Xenon – Helium Laser.

UNIT III SEMICONDUCTOR LASERS 9

Semiconductor Laser Theory – Structure – Excitation – Gain Coefficient and Threshold Density – Passive – Active and Injection Locking Mode – HetroStructure – Large Optical Cavity and Quantum Well and Quantum Dot Lasers – External Cavity Lasers –Vertical Cavity Surface Emitting Lasers – Pumped Lasers.

UNIT IV LASER AMPLIFIERS 9

Absorption and Gain – Laser Oscillation above Threshold – Amplification of Short and Long Duration Pulses – Pumping Requirements and Techniques – Fiber Non – Linearity – Optical Amplifiers – Rare Earth Doped Fiber Amplifiers – Fiber Lasers – Soliton Lasers – Raman Fiber Laser.

UNIT V APPLICATIONS 9

Holography – Optical Communication – LIDAR – Remote Sensing – Bio Medical Applications– Industrial Applications – Metal Cutting and Welding Processes – Optical Metrology and Precision Measurements.

Total: 45

TEXT BOOKS

1. J.T.Verdeyan, “Laser Electronics”, Prentice Hall India, New Delhi, 1995.
2. Jeff Hecht, “The Laser Guide Book” McGraw Hill Professional, 2nd Edition, 1999.
3. Anthony E.Siegman, “Lasers”, University Science Books, 1986.

REFERENCES

1. William T.Silfvast, “Laser fundamentals”, Cambridge University Press, 2nd Edition, 2004.
2. H.Koebner, “Industrial Applications of Lasers”, John Wiley, New York, 1984.

OC5009 – SOLITON IN OPTICAL COMMUNICATION

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UNIT I FUNDAMENTALS 9

Solitons – an Introduction – Soliton based communication systems – fiber solitons – Non Linear Schrodinger equation and a solitary wave solution – temporal soliton dynamics – Parameters for Soliton transmission – Loss Managed Soliton – Dispersion Managed Soliton.

UNIT II DARK SOLITONS AND PERTURBATION METHODS 9

Dark solitons – Kerr medium – Inverse scattering transforms – Non – kerr Media – Soliton solutions – Perturbation methods – Conservation Laws – Stability.

UNIT III SOLITON RESHAPING AND TRANSMISSION CONTROL 9

Reshaping schemes – Lie transformation – guiding centre soliton – Reshaping of solitons in Erbium doped fiber amplifiers and Raman amplifiers – Soliton transmission control: The Gordon Haus limit – Guiding Filter – Soliton control in frequency and time domains – Synchronization techniques.

UNIT IV INTERACTION BETWEEN SOLITONS 9

Two soliton interaction in the same element – suppression – Soliton interaction in different channels: Wavelength division multiplexing – Birefringence effects and polarization division multiplexing.

UNIT V SOLITON TRANSMISSION AND APPLICATIONS 9

Soliton based communication system design – High capacity Soliton systems – long distance soliton transmission – Soliton laser – Optical soliton switching – WDM Soliton systems – spatial soliton application.

Total: 45

TEXT BOOKS

1. Akira Hazegawa an Yuji Kodama, “Solitons in Optical Communication”, Oxford University Press Inc, Oxford, 1995.
2. Govind P. Agarwal, “Non Linear fiber Optics”, Academic Press, New York, 1995.

REFERENCES

1. Y.S. Kivshar, “Optical Solitons: From fibers to Photonic Crystals”, Academic Press, 2003.
2. Iannone Engenio, Matera Francesco, Mecozzi Antonio & Settembre Marina, “Non Linear Optical Communication Networks”, John Wiley and Sons, NewYork, 1998.

AN5101 – ADVANCED DIGITAL SIGNAL PROCESSING

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[Review of discrete – time signals and systems – DFT and FFT – Z –Transform – Digital Filters is recommended]

UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9

Discrete Random Processes – Ensemble averages – stationary processes – Autocorrelation and Auto covariance matrices. Parseval's Theorem – Wiener – Khintchine Relation – Power Spectral Density – Periodogram Spectral Factorization – Filtering random processes. Low Pass Filtering of White Noise – Parameter estimation – Bias and consistency.

UNIT II SPECTRUM ESTIMATION 9

Estimation of spectra from finite duration signals – Non – Parametric Methods –Correlation Method – Periodogram Estimator – Performance Analysis of Estimators – Unbiased – Consistent Estimators – Modified periodogram – Bartlett and Welch methods – Blackman – Tukey method. Parametric Methods – AR – MA – ARMA model based spectral estimation. Parameter Estimation – Yule – Walker equations – solutions using Durbin's algorithm

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Linear prediction – Forward and backward predictions – Solutions of the Normal equations – Levinson – Durbin algorithms. Least mean squared error criterion – Wiener filter for filtering and prediction – FIR Wiener filter and Wiener IIR filters – Discrete Kalman filter

UNIT IV ADAPTIVE FILTERS 9

FIR adaptive filters – adaptive filter based on steepest descent method – Widrow – Hoff LMS adaptive algorithm – Normalized LMS. Adaptive channel equalization –Adaptive echo cancellation –Adaptive noise cancellation – Adaptive recursive filters (IIR). RLS adaptive filters – Exponentially weighted RLS – sliding window RLS.

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING 9

Mathematical description of change of sampling rate – Interpolation and Decimation – Decimation by an integer factor – Interpolation by an integer factor – Sampling rate conversion by a rational factor – Filter implementation for sampling rate conversion – direct form FIR structures – Polyphase filter structures – time – variant structures. Multistage implementation of multirate system. Application to sub band coding – Wavelet transform and filter bank implementation of wavelet expansion of signals.

L: 45 T: 15: Total: 60

TEXT BOOKS

1. Monson H.Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley and Sons, Inc., Singapore, 2002.
2. John G..Proakis et.al., "Algorithms for Statistical Signal Processing", Pearson Education, 2002.

REFERENCES

1. John G..Proakis, Dimitris G.Manolakis, "Digital Signal Processing", Pearson Education, 2002.
2. Dimitris G.Manolakis et.al., "Statistical and adaptive signal Processing", McGraw Hill, Newyork, 2000.
3. Rafael C. Gonzalez, Richard E.Woods, "Digital Image Processing", Pearson Education - Inc., 2nd Edition, 2004. (For Wavelet Transform Topic)

AN5001 – DIGITAL IMAGE PROCESSING

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UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems – Elements of visual perception – psycho visual model – brightness – contrast – hue – saturation – mach band effect – Color image fundamentals – RGB – HSI models – Image sampling – Quantization – dither – Two – dimensional mathematical preliminaries.

UNIT II IMAGE TRANSFORMS 9

1D DFT – 2D transforms – DFT – DCT – Discrete Sine – Walsh – Hadamard – Slant – Haar – KLT – SVD – Wavelet Transform.

UNIT III IMAGE ENHANCEMENT AND RESTORATION 9

Histogram modification and specification techniques – Noise distributions – Spatial averaging – Directional Smoothing – Median – Geometric mean – Harmonic mean – Contraharmonic and Yp mean filters – Homomorphic filtering – Color image enhancement. Image Restoration – degradation model – Unconstrained and Constrained restoration – Inverse filtering – removal of blur caused by uniform linear motion – Wiener filtering – Geometric transformations – spatial transformations – Gray – Level interpolation.

UNIT IV IMAGE SEGMENTATION AND RECOGNITION 9

Edge detection – Image segmentation by region growing – region splitting and merging – edge linking – Image Recognition – Patterns and pattern classes – Matching by minimum distance classifier – Matching by correlation – Back Propagation Neural Network – Neural Network applications in Image Processing.

UNIT V IMAGE COMPRESSION 9

Need for data compression – Huffman –. Run Length Encoding – Shift codes – Arithmetic coding – Vector Quantization – Block Truncation Coding. Transform Coding – DCT and Wavelet. JPEG – MPEG. Standards – Concepts of Context based Compression.

Total: 45

TEXT BOOKS

1. William K.Pratt, “Digital Image Processing”, John Wiley, NewYork, 2002.
2. Sid Ahmed - M.A., “Image Processing Theory - Algorithms and Architectures”, McGrawHill, 1995.

REFERENCES

1. Rafael C. Gonzalez, Richard E.Woods, “Digital Image Processing”, 2nd Edition, Pearson Education, Inc., 2004.
2. Anil K. Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 2002.
3. David Salomon, “Data Compression - The Complete Reference”, 2nd Edition, Springer Verlag New York Inc., 2001

AN5006 – DESIGN AND ANALYSIS OF ALGORITHMS

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UNIT I FUNDAMENTALS 9

Polynomial and Exponential algorithms – big "oh" and small "oh" notation – exact algorithms and heuristics – direct / indirect / deterministic algorithms – static and dynamic complexity – stepwise refinement.

UNIT II DESIGN TECHNIQUES 9

Subgoals method – working backwards – work tracking – branch and bound algorithms for traveling salesman problem and knapsack problem – hill climbing techniques – divide and conquer method – dynamic programming – greedy methods.

UNIT III SEARCHING AND SORTING 9

Sequential search – binary search – block search – Fibbonacci search – bubble sort – bucket sorting – quick sort – heap sort – average case and worst case behavior – FFT.

UNIT IV GRAPH ALGORITHMS 9

Minimum spanning – tree – shortest path algorithms – R – connected graphs – Even's and Kleitman's algorithms – max – flow min cut theorem – Steiglitz's link deficit algorithm.

UNIT V SELECTED TOPICS 9

NP Completeness Approximation Algorithms – NP Hard Problems – Strasseu's Matrix Multiplication Algorithms – Magic Squares – Introduction To Parallel Algorithms and Genetic Algorithms – Monti – Carlo Methods – Amortised Analysis.

Total: 45

TEXT BOOKS

1. Sara Baase, “Computer Algorithms: Introduction to Design and Analysis”, Addison Wesley, 1988.
2. E.Horowitz and S.Sahni, “Fundamentals of Computer Algorithms”, Galgotia Publications, 1988.

REFERENCES

1. T.H.Corman, C.E.Leiserson and R.L.Rioest, “Introduction to Algorithms”, Mc Graw Hill, 1994.
2. D.E.Goldberg, “Genetic Algorithms: Search Optimization and Machine Learning”, Addison Wesley, 1989.

AN5008 – INTERNETWORKING MULTIMEDIA

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UNIT I MULTIMEDIA NETWORKING 9

Digital sound – video and graphics – basic multimedia networking – multimedia characteristics – evolution of Internet services model – network requirements for audio/ video transform – multimedia coding and compression for text – image – audio and video.

UNIT II BROADBAND NETWORK TECHNOLOGY 9

Broadband services – ATM and IP – IPV6 – High speed switching – resource reservation – Buffer management – traffic shaping – caching – scheduling – and policing – throughput – delay and jitter performance. Storage and media services – voice and video over IP – MPEG – 2 over ATM/IP – indexing synchronization of requests – recording and remote control.

UNIT III RELIABLE TRANSPORT PROTOCOL AND APPLICATIONS 9

Multicast over shared media network – multicast routing and addressing – scaling multicast and NBMA networks – Reliable transport protocols – TCP adaptation algorithm – RTP – RTCP. MIME – Peer – to – Peer computing – shared application – video conferencing – centralized and distributed conference control – distributed virtual reality – light weight session philosophy.

UNIT IV MULTIMEDIA COMMUNICATION STANDARDS 9

Objective of MPEG – 7 standard – Functionalities and systems of MPEG – 7 – MPEG –21 Multimedia Framework Architecture – Content representation – Content Management and usage – Intellectual property management Audio visual systems – H322: Guaranteed QOS LAN systems MPEG_4 video Transport across internet.

UNIT V MULTIMEDIA COMMUNICATION ACROSS NETWORKS 9

Packet Audio/video in the network environment – video transport across Generic networks – Layered video coding – error Resilient video coding techniques – Scalable Rate control – Streaming video across Internet – Multimedia transport across ATM networks and IP network – Multimedia across wireless networks.

Total: 45

TEXT BOOKS

1. Jon Crowcroft, Mark Handley, Ian Wakeman, “Internetworking Multimedia”, Harcourt Asia Pvt. Ltd. Singapore, 1998.
2. K.R.Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic, “Multimedia Communication systems”, PHI, 2003. (Unit IV and UNIT V)

REFERENCES

1. B.O. Szuprowicz, “Multimedia Networking”, McGraw Hill, Newyork, 1995.
2. Tay Vaughan, “Multimedia making it to work”, 4th Edition, Tata McGraw Hill,2000.

AN5009 – ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY IN SYSTEM DESIGN

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UNIT I EMIENVIRONMENT 9

EMI/EMC concepts and definitions – Sources of EMI – conducted and radiated EMI – Transient EMI – Time domain Vs Frequency domain EMI – Units of measurement parameters – Emission and immunity concepts – ESD.

UNIT II EMI COUPLING PRINCIPLES 9

Conducted – Radiated and Transient Coupling – Common Impedance Ground Coupling – Radiated Common Mode and Ground Loop Coupling – Radiated Differential Mode Coupling – Near Field Cable to Cable Coupling – Power Mains and Power Supply coupling.

UNIT III EMI/EMC STANDARDS AND MEASUREMENTS 9

Civilian standards – FCC – CISPR – IEC – EN – Military standards – MIL STD 461D/462 – EMI Test Instruments /Systems – EMI Shielded Chamber – Open Area Test Site – TEM Cell – Sensors/Injectors/Couplers – Test beds for ESD and EFT – Military Test Method and Procedures (462).

UNIT IV EMI CONTROL TECHNIQUES 9

Shielding – Filtering – Grounding – Bonding – Isolation Transformer – Transient Suppressors – Cable Routing – Signal Control – Component Selection and Mounting.

UNIT V EMC DESIGN OF PCBs 9

PCB Traces Cross Talk – Impedance Control – Power Distribution Decoupling – Zoning – Motherboard Designs and Propagation Delay Performance Models.

Total: 45

TEXT BOOKS

1. V.P.Kodali, “Engineering EMC Principles Measurements and Technologies”, IEEE Press, 1996.
2. Bernhard Keiser, “Principles of Electromagnetic Compatibility”, 3rd Edition, Artech house, 1986.

REFERENCES

1. Henry W.Ott, “Noise Reduction Techniques in Electronic Systems”, John Wiley and Sons”, NewYork, 1988.
2. C.R.Paul, “Introduction to Electromagnetic Compatibility”, John Wiley and Sons, Inc, 1992.

AN5010 – HIGH PERFORMANCE COMMUNICATION NETWORKS

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UNIT I PACKET SWITCHED NETWORKS 9

OSI and IP models – Ethernet (IEEE 802.3) – Token ring (IEEE 802.5) – Wireless LAN (IEEE 802.11) FDDI – DQDB – SMDS: Internetworking with SMDS

UNIT II ISDN AND BROADBAND ISDN 9

ISDN – overview – interfaces and functions – Layers and services – Signaling System 7 – Broadband ISDN architecture and Protocols.

UNIT III ATM AND FRAME RELAY 9

ATM: Main features – addressing – signaling and routing – ATM header structure –adaptation layer – management and control – ATM switching and transmission.

Frame Relay Protocols and services – Congestion control – Internetworking with ATM – Internet and ATM – Frame relay via ATM.

UNIT IV ADVANCED NETWORK ARCHITECTURE 9

IP forwarding architectures overlay model – Multi Protocol Label Switching (MPLS) – integrated services in the Internet – Resource Reservation Protocol (RSVP) – Differentiated services

UNIT V BLUE TOOTH TECHNOLOGY 9

The Blue tooth module – Protocol stack Part I: Antennas – Radio interface – Base band – The Link controller – Audio – The Link Manager – The Host controller interface The Blue tooth module – Protocol stack Part I: Logical link control and adaptation protocol – RFCOMM – Service discovery protocol – Wireless access protocol – Telephony control protocol.

Total: 45

TEXT BOOKS

1. Jean Walrand and Pravin varaiya, “High Performance Communication networks”, 2nd Edition, Harcourt and Morgan Kauffman, London, 2000.
2. Sumit Kasera, Pankaj Sethi, “ATM Networks”, Tata McGraw – Hill, New Delhi, 2000.

REFERENCES

1. William Stallings, “ISDN and Broadband ISDN with Frame Relay and ATM”, 4th Edition, Pearson education Asia, 2002.
2. Leon Gracia, Widjaja, “Communication networks”, Tata McGraw - Hill, New Delhi, 2000.
3. William Stallings, “High speed Networks and Internets”, 2nd Edition, Pearson education Asia, 2003.

CO5103 – OPTICAL COMMUNICATION NETWORKS

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UNIT I OPTICAL NETWORKING COMPONENTS 9

First – and second – generation optical networks – Components: couplers – isolators – circulators – multiplexers – filters – amplifiers – switches – and wavelength converters.

UNIT II SONET AND SDH NETWORKS 9

Integration of TDM signals – Layers – Framing – Transport overhead – Alarms – Multiplexing – Network elements – Topologies – Protection architectures – Ring architectures – Network Management.

UNIT III BROADCAST – AND – SELECT NETWORKS 9

Topologies – Single – hop – Multihop – and Shufflenet multihop networks – Media –Access control protocols – Test beds.

UNIT IV WAVELENGTH –ROUTING NETWORKS 9

Node designs – Network design and operation – Optical layer cost Tradeoffs – Routing and Wavelength assignment – Wavelength routing test beds.

UNIT V HIGH CAPACITY NETWORKS 9

SDM – TDM – and WDM approaches – Application areas – Optical TDM Networks: Multiplexing and demultiplexing – Synchronization – Broadcast networks – Switch –based networks – OTDM test beds.

Total: 45

REFERENCES

1. Rajiv Ramaswami and Kumar Sivarajan, “Optical Networks: A practical perspective”, 2nd Edition, Morgan Kaufmann, 2001.
2. Vivek Alwayn, “Optical Network Design and Implementation”, Pearson Education, 2004.
3. Hussein T.Mouftab and Pin - Han, “Ho - Optical Networks: Architecture and Survivability”, Kluwer Academic Publishers, 2002.
4. Biswanath Mukherjee, “Optical Communication Networks”, McGraw Hill, 1997.

CO5001 – RF SYSTEM DESIGN

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UNIT I RF ISSUES **9**

Importance of RF design, Electromagnetic Spectrum, RF behaviour of passive components, Chip components and Circuit Board considerations, Scattering Parameters, Smith Chart and applications.

UNIT II RF FILTER DESIGN **9**

Overview , Basic resonator and filter configuration, Special filter realizations, Filter implementations, Coupled filter.

UNIT III ACTIVE RF COMPONENTS & APPLICATIONS **9**

RF diodes, BJT, RF FETs, High electron mobility transistors; Matching and Biasing Networks – Impedance matching using discrete components, Microstripline matching networks, Amplifier classes of operation and biasing networks.

UNIT IV RF AMPLIFIER DESIGNS **9**

Characteristics, Amplifier power relations, Stability considerations, Constant gain circles, Constant VSWR circles, Low Noise circuits, Broadband , high power and multistage amplifiers.

UNIT V OSCILLATORS, MIXERS AND APPLICATIONS **9**

Basic Oscillator model, High frequency oscillator configuration, Basic characteristics of Mixers; Phase Locked Loops; RF directional couplers and hybrid couplers; Detector and demodulator circuits.

Total: 45

REFERENCES

1. Reinhold Ludwig and Powel Bretchko, “RF Circuit Design - Theory and Applications”, 1st Edition, Pearson Education Asia, 2001.
2. Joseph .J. Carr, “Secrets of RF Circuit Design”, 3rd Edition, McGraw Hill Publishers, 2000.
3. Mathew M. Radmanesh, “Radio Frequency & Microwave Electronics”, 2nd Edition, Pearson Education Asia, 2002.
4. Ulrich L. Rohde and David P. NewKirk, “RF / Microwave Circuit Design”, John Wiley & Sons, USA, 2000.
5. Roland E. Best, “Phase - Locked Loops: Design, simulation and applications”, 5th edition McGraw Hill Publishers, 2003.

CO1632 DIGITAL COMMUNICATION RECEIVERS

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UNIT I REVIEW OF DIGITAL COMMUNICATION TECHNIQUES 9

Base band and band pass communication – signal space representation – linear and non – linear modulation techniques – and spectral characteristics of digital modulation.

UNIT II OPTIMUM RECEIVERS FOR AWGN CHANNEL 9

Correlation demodulator – matched filter – maximum likelihood sequence detector – Optimum receiver for CPM signals – M – ary orthogonal signals – envelope detectors for M – ary and correlated binary signals.

UNIT III RECEIVERS FOR FADING CHANNELS 9

Characterization of fading multiple channels – statistical models – slow fading – frequency selective fading – diversity technique – RAKE demodulator – coded waveform for fading channel.

UNIT IV SYNCHRONIZATION TECHNIQUES 9

Carrier and symbol synchronization – carrier phase estimation – PLL – Decision directed loops – symbol timing estimation – maximum likelihood and non –decision directed timing estimation – joint estimation.

UNIT V ADAPTIVE EQUALIZATION 9

Zero forcing algorithm – LMS algorithm – Adaptive decision – feedback equalizer – and equalization of Trellis – coded signals – Kalman algorithm – blind equalizers – and stochastic gradient algorithm – Echo cancellation.

Total: 45

REFERENCES

1. Heinrich Meyer, Mare Moeneclacy, Stefan.A. Fechtel, “Digital Communication Receivers”, Vol I & II, John Wiley, New York, 1997.
2. John. G. Proakis, “Digital Communication”, 4th Edition”, McGraw Hill, NewYork, 2001.
3. E.A. Lee and D.G. Messerschmitt, “Digital Communication”, 2nd Edition, Allied Publishers, New Delhi, 1994.
4. Simon Marvin, “Digital Communication Over Fading channel An unified approach to performance Analysis”, John Wiley, New York, 2000.
5. Bernard Sklar, “Digital Communication Fundamentals and Applications”, Prentice Hall, 1998.