ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

ELECTRONICS AND COMMUNICATION ENGINEERING (ECE)

Semester VIII/ ECE/ B.TECH

Sl No	Sub-Code	Subject	Hrs			Credits
			L	T	P	C
		Theory				
1	EC131801	Optical Communication	3	0	0	3
2	CS131802	Computer Architecture and Organization	3	0	0	3
3	EC1318E03	Elective III(Departmental)	3	0	0	3
4	EC1318E04	Elective IV(Departmental)	3	0	0	3
5	**1318E05	Elective V(Open)	3	0	0	3
		Practical				
6	EC131811	Optical Communication Lab	0	0	2	1
7	EC131816	Project	0	0	10	5
8	EC131821	Comprehensive Viva	0	0	0	4
		Total	15	0	12	**25**
Total Contact Hours: 27						
Total Credits : 25						

Elective-III Subjects		
Sl No	**Subject Code**	**Subject**
1	EC1318E03(I)	Fuzzy Logic and Neural Network
2	EC1318E03(II)	Digital Image Processing
3	EC1318E03(III)	Wireless Communication
4	EC1318E03(IV)	Any other subject offered from time to time with the approval of the university

Elective-IV Subjects		
Sl No	**Subject Code**	**Subject**
1	EC1318E04(I)	Radar Engineering
2	EC1318E04(II)	CAD for VLSI
3	EC1318E04(III)	Biomedical Instrumentation
4	EC1318E04(IV)	Any other subject offered from time to time with the approval of the university

Elective-V Subjects		
Sl No	**Subject Code**	**Subject**
1	**1318E05(I)	Engineering System Analysis and Design
2	**1318E05(II)	Planning for Sustainable Development
3	**1318E05(III)	Disaster Management
4	**1318E05(IV)	Antenna and Wave Propagation
5	**1318E05(V)	Any other subject offered from time to time with the approval of the university

Course Title: OPTICAL COMMUNICATION
Course Code: EC131801
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**OVERVIEW OF OPTICAL FIBER COMMUNICATIONS**	Electromagnetic spectrum, Optical Spectral bands, Evolution of fiber optic system, Elements of an optical fiber transmission link with the functional description of each block, transmission widows, advantages of optical fiber link over conventional copper systems, applications of fiber optic transmission systems.	3
2.	**OPTICAL FIBERS: STRUCTURES, WAVE GUIDING AND FABRICATION**	Optical laws and definitions, optical fiber modes and configurations, Mode theory, Step Index and Graded Index (GI) fibers, single mode and graded index fibers, Derivation for numerical aperture, V number and modes supported by step index fiber, mode field ,Numerical aperture and modes supported by GI fibers, fiber materials, linearly Polarized modes, Chromatic Dispersion, Polarization Mode Dispersion, Dispersion-Induced Limitations, Fiber Losses, Nonlinear Optical Effects, fiber fabrication techniques, and mechanical properties of fibers, fiber optic cables.	7
3.	**OPTICAL TRANSMITTERS**	Light-Emitting Diodes: Semiconductor Physics background, Light emitting diode (LEDs)-structures, materials, Figure of merits, characteristics & Modulation. Laser Diodes: Modes, threshold conditions, Control of Longitudinal Modes, Laser Characteristics, Diode Rate equations, resonant frequencies, structures, characteristics and figure of merits, single mode lasers, Modulation of laser diodes, Spectral width, temperature effects, and Light source linearity. LED drive circuits, Laser drive circuits, Transmitter Design.	7
4.	**POWER LAUNCHING AND COUPLING**	Source to fiber power launching, Lensing schemes, fiber-to-fiber joints, LED coupling to single mode fibers, fiber splicing, Optical fiber connectors.	3

5.	**OPTICAL RECEIVERS**	Principles of operation, types, characteristics, figure of merits of detectors, photodiode materials, photo detector noise, detector response time, temperature effects on gain, Common Photo detectors, Receiver Design, Receiver operation, Preamplifier types, receiver performance and sensitivity, Sensitivity Degradation, Eye diagrams, Coherent detection, Specification of receivers.	6
6.	**TRANSMISSION SYSTEMS**	Point –to-point link –system considerations, Link power budget and rise time budget methods for design of optical link, BER calculation.	3
7.	**OPTICAL AMPLIFIERS**	Semiconductor Optical Amplifiers, Raman Amplifiers, Erbium-Doped Fiber Amplifiers, Parametric Amplifiers, System Applications.	3
8.	**ADVANCES IN OPTICAL FIBER SYSTEMS AND COMPONENTS**	Principles of WDM, DWDM, Telecommunications & broadband application, SONET/SDH, Analog & Digital broadband, optical switching, Optical couplers, Tuneable sources and Filters, optical MUX/DEMUX, Arrayed waveguide grating, optical add drop multiplexer (OADM), optical circulators, attenuators, optical cross connects, wavelength converter, Mach-Zender Interferometer.	4

Text Books / References

1. Optical Fiber Communication by John M. Senior (PHI/Pearson)
2. Fiber optical communication Technology by Djafar Mymbaev & Lowell L, Scheiner. (Pearson)
3. Fiber optic Communication Systems by G. Agrawal (John Wiley and sons)
4. Optical Fiber Communications by Gerd Keiser, 4th Edition (Mc Graw Hill)
5. Optical networks – A practical perspective by Rajiv Ramaswamy, K.N.Sivaranjan and Galen H. Sasaki (Morgan Kaufman)

Course Title: COMPUTER ARCHITECTURE AND ORGANIZATION
Course Code: CS131802
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**EVOLUTION OF COMPUTER**	Introduction, different generations till the present time. Basic structure of a computer	3
2.	**DESIGN METHODOLOGY**	Components and design techniques at gate level, resistor level and processor level. Processing Unit of a Computer.	5
3.	**PROCESSOR ORGANIZATION**	Number formats. Instruction formats, instruction types. Fixed point arithmetic, addition, subtraction, division and multiplication	7
4.	**ALU**	Organization floating point arithmetic, arithmetic processor	4
5.	**CONTROL UNIT**	Instruction sequencing and interpretation. Control unit design.	5
6.	**MEMORY ORGANIZATION**	Types of memories. Memory device characteristics. RAM organization. Memory hierarchies. Cost and performance Virtual memories. High speed memories like caches.	6
7.	**PARALLEL PROCESSING**	Introduction and types of parallel processors with performance considerations. Pipe-line processors and multiple processors.	6

TEXT/ REFERENCE BOOKS:

1. John P Hayes - Computer Architecture & Organization, Mc Graw Hill Book Company.

2. M. Mano - Computer System Architecture, Prentice-Hall of lndia.

Course Title: ELECTIVE III (Departmental)
Course Code: EC1318E03(I)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

FUZZY LOGIC AND NEURAL NETWORK

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**FUZZY LOGIC**	Basic concepts of Fuzzy logic, Fuzzy vs Crisp set, Linguistic variables, membership functions, operations of Fuzzy sets, Fuzzy if-then rules, Variables inference techniques, Fuzzicification and defuzzification techniques	8
2.	**BASIC FUZZY INTERFERENCE ALGORITHM, APPLICATION OF FUZZY LOGIC ,FUZZY LOGIC CONTROL**	Mamdani and Takagi and sugeno Architectures. Application to pattern recognition. Fuzzy system design implementation , useful tools supporting design	6
3.	**NEURAL NETWORKS CHARACTERISTICS**	History of Development in neural networks, Artificial neural networks terminology, model of a neuron, Topology, Types of learning. Supervised, Unsupervised learning.	8
4.	**BASIC LEARNING LAWS**	Hebb's rule, Delta rule, widrow and Hoff LMS learning rule, correlation learning rule instar and ouster learning rules. Unsupervised Learning: Competitive learning, K-means clustering algorithm, Kohonen's feature maps.	6
5.	**RADIAL BASIS FUNCTION NEURAL NETWORKS**	Recurrent networks, Real time recurrent and learning algorithm. Introduction to Counter propagation Networks- CMAC Network, ART networks, Application of NN in pattern recognition, optimization, Control, Speech and decision making.	8

Textbooks / References :

1. Berkin Riza C and Trubatch, "Fuzzy System design principles- Building Fuzzy IF-THEN rule bases", IEEE Press.
2. Yen and Langari, "Fuzzy Logic: Intelligence, Control and Information", Pearson Education.
3. Timothy J. Ross, Fuzzy Logic with Engineering Applications, MacGraw-Hill
4. Shivanandam and Deepa, Principles of Soft Computing, Wiley
5. Jang JSR, Sun CT, Mizutani E, Neuro-Fuzzy and Soft Computing, PHI

6. Kosko,Neural Networks and Fuzzy Systems, Pearson edu
7. Yegna Narayanan, “Artificial Neural Networks”. 8th Printing. PHI (2003)
8. Patterson Dan W, “Introduction to artificial Intelligence and Expert systems”, 3rd Ed., PHI
9. Simon Haykin, “Neural Networks” Pearson Education.
10. Jacek M Zaurada, “Introduction to artificial neural Networks Jaico Publishing Home, Fouth Impression

Course Title: ELECTIVE III (Departmental)
Course Code: EC1318E03(II)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

DIGITAL IMAGE PROCESSING

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**FUNDAMENTALS OF IMAGE PROCESSING**	Introduction to structure of human eye, Image formation in eye, brightness adaption and discrimination, Image sensing and acquisition, storage, Sampling and quantization, types of images, relationship between pixels, colour model	3
2.	**IMAGE TRANSFORMS**	DFT and 2D DFT, properties of DFT, FFT and IFFT, Walsh Transform, Hadamard transform, Discrete Cosine Transform, Slant Transform, KL transform	4
3.	**IMAGE ENHANCEMENT IN SPATIAL AND FREQUENCY DOMAIN**	Introduction to image enhancement, Intensity transformations, Histogram Processing and Equalization, Spatial Filtering: Smoothing, Sharpening filters, Frequency Domain Filters: Homomorphic filtering	7
4.	**IMAGE RESTORATION**	Introduction, Degradation model, Inverse Filtering, Weiner Filtering	3
5.	**IMAGE COMPRESSION**	Fundamentals, Redundancies: Coding, Interpixel and psychovisual redundancies, Fidelity criteria, Image Compression Model, Lossy Compression: variable length coding and bit plane coding, Lossless Compresssion: transform coding, Image Compression Standards: Binary Image and Continuous tone still image compression standards.	7
6.	**IMAGE SEGMENTATION, REPRESENTATION AND DESCRIPTION**	Detection of discontinuities, Edge linking and boundary detection, Thresholding Region based segmentation, Image Representation Schemes, Boundary Descriptors and regional descriptors	7
7.	**MORPHOLOGICAL PROCESSING**	Introduction, dilation, erosion, opening, closing, Morphological algorithms operation on Binary and Gray scale Image	5

Text Books:

1. R. C Gonzalez and R.E. Woods, Digital Image Processing, Prentice Hall
2. R. C Gonzalez ,Digital Image Processing using MATLAB, TMH-2nd edition

Reference Books:

1. A.K.Jain, “Fundamentals of Digital Image Processing”, PHI
2. S. Annadurai and R. Shanmugalakshmi, “Fundamentals of Digital Image Processing”, Pearson
3. K.R. Castleman, “Digital Image Processing”, PHI
4. W.K.Pratt, “Digital Image Processing”, John Wiley Interscience
5. S. Sridhar, “Digital Image Processing”, Oxford

Course Title: ELECTIVE III (Departmental)
Course Code: EC1318E03(III)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

WIRELESS COMMUNICATION

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**MODERN MOBILE WIRELESS COMMUNICATION SYSTEMS**	Evolution strategies – First Generation (1G) to Fourth Generation (4G), Personal Area Networks :PAN, Low Tier Wireless System: Cordless Telephone, Second Generation (CT2), Digital European Cordless Telecommunications (DECT), Public wide-area Wireless Networks: 1 G to 3G cellular networks	3
2.	**CELLULAR MOBILE WIRELESS NETWORKS: SYSTEMS AND DESIGN FUNDAMENTALS**	Brief introduction to mobile wireless communication and systems, Description of cellular system, Cellular Structure, Frequency Reuse, Cell clustering, Capacity enhancement techniques for cellular networks, cell splitting, antenna sectoring, Co-channel and Adjacent channel interferences, Channel assignment schemes – Fixed channel, Dynamic channel and Hybrid channel, mobility management – location management and handoff management, handoff process, different types of handoff.	8
3.	**CHARACTERISTICS OF WIRELESS CHANNEL AND PROPAGATION PATH LOSS MODELS**	Different Multi-path propagation mechanisms, Multi-path effects on mobile communication, Fading, different types of fading, small and large scale fading, slow and fast fading, narrowband and wideband fading, Inter symbol interference, fast fading model, Doppler effect due to velocity of mobiles, Rayleigh envelop, free space propagation model, two ray ground reflection model, Knife-edge diffraction model, log normal shadowing model, macro and micro cell propagation models, types of base stations and mobile station antennas.	8
4.	**MULTIPLE ACCESS TECHNOLOGIES IN CELLULAR COMMUNICATION**	Time division multiple access (TDMA), narrowband and wideband TDMA, synchronous and asynchronous TDMA, Frequency division multiple access (FDMA), Code Division Multiple Access (CDMA), Direct-sequence CDMA, spread spectrum technique, spectral efficiency of different wireless access technologies: Spectral	8

		Efficiency in FDMA system, Spectral Efficiency in TDMA system, Spectral Efficiency for DS-CDMA system	
5.	**EQUALIZATION AND DIVERSITY**	Equalizers in a communication receiver. Channel equalization: linear equalization and nonlinear equalization. Concept of diversity. Macroscopic and microscopic diversity. Diversity mechanisms: frequency, time, space, polarization and pattern. Diversity combining: selection, equal-ratio combining and maximal-ratio combining. Transmit diversity.	4
6.	**WIRELESS BROADBAND NETWORKS AND ACCESS**	Evolution of broadband wireless, IEEE 802.16 standards : WiMAX , Spectrum Allocation, IEEE 802.16 Standard Architecture,Overview of WiMAX PHY, IEEE 802.16 MAC Layer, IEEE 802.16 Scheduling Services, Unsolicited Grant Service (UGS), Realtime Polling Service (rtPS), Non-real-time Polling Service (nrtPS), Best Effort (BE) Overview of 3G Long Term Evolution (3G LTE) for broadband wireless communication, Orthogonal FrequencyDivision MultipleAccess (OFDMA)	5

TEXT BOOKS:

1. Wireless Networks: Applications and Protocols, T. S. Rappaport, Pearson Education
2. Wireless Communication and Networks: 3G and Beyond, I. Saha Misra, TMH Education.
3. Wireless Communications: Principles and Practice, T.S.Rappaport, PHI Learning.
4. Wireless Communications, Goldsmith, Cambridge University Press.

Course Title: ELECTIVE IV (Departmental)
Course Code: EC1318E04 (I)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

RADAR ENGINEERING

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTRODUCTION TO RADAR**	Historical background , radar terminology, radar band designations, Radar block diagram, radar equation: detection of signals in noise and signal to noise ratio, Probabilities of detection & False alarm, integration of radar pulses, radar cross section, distributed targets, Transmitted power, pulse repetition frequency, antenna parameters & system losses, introduction to radar clutter.	8
2.	**RADAR TYPES**	Pulse radars and CW radars, Advantages of coherent radar, Doppler radar and MTI: Doppler effect, delay line cancellers, blind speeds, staggered PRFs, Digital filter bank, Moving Target Detector, limitations of MTI, Tracking with radar, monopulse tracking, conical scan, limitation to tracking accuracy.	8
3.	**RADAR SIGNAL AND CLUTTER**	Basic Radar Measurement, Theoretical accuracy of radar measurements, Range and velocity ambiguities, the ambiguity diagram, pulse compression principles, the matched filter, chrip waveforms, Waveform design: nonlinear FM, phase codes, waveform generation and compression, Description of land and sea clutter, statistical models for surface clutter, detection of targets in clutter.	10
4.	**DEVICES AND RADAR SYSTEMS**	Radar transmitter: Solid state RF power source, Magnetron, other RF power source, Radar Receiver: Super heterodyne receiver, receiver noise figure, duplexers and diplexers, Receiver Protectors, Applications:: Electronic warfare: ESM,ECM, ECCM; super resolution, IFM, types of jammers, Stealth and counter stealth: stealth techniques for aircraft and other target types, low frequency and UWB radar, system design examples.	10

Text books:

1. M.I.Skolnik,"Introduction to Radar systems-3/E"(Tata McGraw-Hill)
2. M.H.Carpentier,"Principles of Modern Radar System"(Artech House)

Reference Books:

1. M.I.Skolnik,"Radar Handbook" (Tata McGraw-Hill)
2. M.I.Richards,"Fundamentals of Radar Signal Processing"(Tata McGraw-Hill)

Course Title: ELECTIVE IV (Departmental)
Course Code: EC1318E04 (II)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

CAD for VLSI

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTRODUCTION TO PHYSICAL DESIGN, DESIGN AND FABRICATION OF VLSI DEVICES**	Fabrication process and its impact on Physical Design.	7
2.	**DATA STRUCTURES AND BASIC ALGORITHMS**	Algorithmic Graph theory and computational complexity, Tractable and Intractable problems.	10
3.	**PLACEMENT**	Partitioning, Floorplanning, Placement. **ROUTING** Fundamentals, Global Routing, Detailed Routing, Routing in FPGA's.	12
4.	**SIMULATION**	Logic synthesis: Verification-High level synthesis - Compaction. Physical Design Automation of FPGAs, VHDL-Implementation of Simple circuits using VHDL	7

Text books/ References:

1. Algorithms for VLSI Physical Design Automation, N. A. Shervani
2. Algorithms for VLSI Design Automation, S. H. Gerez

Course Title: ELECTIVE IV (Departmental)
Course Code: EC1318E04 (III)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

BIOMEDICAL INSTRUMENTATION

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**BRIEF INTRODUCTION TO HUMAN PHYSIOLOGY**	Biomedical transducers: displacement, velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases.	9
2.	**BIO-ELECTRODES**	Bio-electrodes and bio-potential amplifiers for ECG, EMG, EEG, etc.	9
3.	**MEASUREMENT OF BLOOD TEMPERATURE, PRESSURE AND FLOW**	Measurement of blood temperature, pressure and flow. Impedance plethysmography. Ultrasonic, X-ray and nuclear imaging.	9
4.	**PROSTHESES AND AIDS**	Pacemakers, defibrillators, heart-lung machine, artificial kidney, aids for the handicapped. Safety aspects.	9

Text/Reference Books:

1. W.F. Ganong, Review of Medical Physiology, 8th Asian Ed, Medical Publishers
2. J.G. Websster, ed., Medical Instrumentation, Houghton Mifflin
3. A.M. Cook and J.G. Webster, eds., Therapeutic Medical Devices, Prentice-Hall

Course Title: ELECTIVE V (Open)
Course Code: **1318E05 (I)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

ENGINEERING SYSTEM ANALYSIS AND DESIGN

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTRODUCTION**	Systems, Elements of a system, Types of systems, Subsystems, Super systems, Need for system analysis and design, CASE tools for analysis and its limitations.	9
2.	**SYSTEM ANALYSIS**	Methods of system analysis, system development life cycle, structured approach, development tools, data base and networking techniques.	9
3.	**SYSTEM DESIGN**	Design technologies, Design principles, Design tools and methodologies, feasibility survey, conversion and testing tools, design management and maintenance tools.	9
4.	**OBJECT ORIENTED ANALYSIS AND DESIGN**	Introduction, Object modeling, Dynamic modeling, functional modelling, UML diagrams and tools.	9

Text Books:

1. Perry Edwards, “System analysis and design”, McGraw Hill international edition
2. Len Fertuck, “System analysis and design with CASE tools”, Wm C. Brown Publishers

Reference Books:

1. Er. V.K. Jain, “System analysis and design “, Dreamtech Press.
2. Kenneth E.Kendall and Julie E.Kendall, “System analysis and design”, Prentice Hall, India

Course Title: ELECTIVE V (Open)
Course Code: **1318E05 (II)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

PLANNING FOR SUSTAINABLE DEVELOPMENT

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**SUSTAINABLE DEVELOPMENT**	Explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: its main principles, the evolution of ideas about sustainability, strategies for promoting sustainable development, resistances to the concept, and some alternative approaches. Examine some important current issues and areas of debate in relation to sustainable development.	12
2.	**INNOVATION FOR SUSTAINABLE DEVELOPMENT**	Environmental management and innovation strategies.	6
3.	**SOCIETAL TRANSFORMATIONS**	Institutional theory.	6
4.	**GOVERNANCE FOR SUSTAINABLE DEVELOPMENT**	Policy responses to environmental degradation.	6
5.	**CAPACITY DEVELOPMENT FOR INNOVATION**	Research methods	6

Text/Reference Books:

1. Harris, J.M. (2204) Basic Principles for Sustainable Development, Global Development and Environment Institute, working paper 00-04. Available at: http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable%20Development.PDF
2. Robinson, J. (2004) Squaring the circle? Some thoughts on the idea of sustainable development Ecological Economics 48(4): 369-384.
3. Hjorth, P. and A. Bagheri Navigating towards Sustainable Development: A System Dynamics Approach, Futures 38: 74-92.
4. Mog, J.M. „Struggling with Sustainability – A Comparative Framework for Evaluating Sustainable Development Programs", World Development 32(12): 2139–2160. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure (PDF – 68 kb)
5. Arundel, A., R. Kemp, and S. Parto Indicators for Environmental Innovation: What and How to Measure, forthcoming in International Handbook on Environment and Technology Management (ETM), edited by D. Annandale, J. Phillimore and D. Marinova, Cheltenham, Edward Elgar.

6. Douthwaite, B. Enabling Innovation. A practical guide to understanding and fostering innovation,
London, Zed Books.

Additional References:
http://www.sustainability.com/developing-value/definitions.asp

Course Title: ELECTIVE V (Open)
Course Code: **1318E05 (III)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

DISASTER MANAGEMENT

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**INTRODUCTION**	Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation).	4
2.	**DISASTERS**	Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.	10
3.	**DISASTER IMPACTS**	Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.	6
4.	**DISASTER RISK REDUCTION (DRR)**	Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.	12
5.	**DISASTERS, ENVIRONMENT AND DEVELOPMENT**	Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.	4

Text/Reference Books:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority).
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.

Course Title: ELECTIVE V (Open)
Course Code: **1318E05 (IV)
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

ANTENNA AND WAVE PROPAGATION

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	**ELECTROMAGNETIC RADIATION**	Introduction, fundamental of radiation and radiation equation, equivalent circuit of transmitting and receiving antennas, single wire configuration for radiation, introduction to dipole and fields from oscillating dipole. Concept of magnetic vector potential, retarded potential, far and near field, radiation from wire antennas like Hertzian Dipole, Half-wave Dipole, Quarter-wave Monopole, Small Loop Antenna; their field components, radiation resistance, characteristics, applications; fields from oscillating Dipole, current distribution on linear dipoles.	4
2.	**ANTENNA CHARACTERISTIC**	Radiation pattern, FBR, HPBW, FNBW, Beam solid angle, Radiation intensity, Directivity, Gain, Input impedance, Radiation resistance, Polarization, Bandwidth, Effective aperture, Vector effective length, Antenna temperature. Some Network theorems *(in brief related to antenna)*	3
3.	**ANTENNA ARRAY**	Electric Field due to 2 element arrays, 3 element Arrays; Pattern Multiplication; Uniform Linear Array: End fire and Broad side; Phased array; Array with non-uniform excitation: Binomial array, Chebyshev array Synthesis. Effect of earth on vertical patterns, radiation resistance	6
4.	**SOME OTHER ANTENNAS**	Isotropic, directional, omni-directional antennas; Resonant and Non-resonant Antennas; Folded dipole, Long wire, V and Rhombic Antennas, Yagi-Uda, Log-periodic antenna, Helical antenna, Spiral antenna.	10
5.	**MICROWAVE ANTENNAS**	Reflector, Horn, Lens, Slot, Micro-Strip antennas *[Major stress on Characteristics features, applications (including frequency at which used), advantages and disadvantages, major design principles and equations (without long and detailed derivations]*	2

6.	**IMPEDANCE MATCHING TECHNIQUES**	Method of excitation of antennas in brief and impedance matching techniques.	3
7.	**ANTENNA MEASUREMENT**	Concept of radiation pattern measurement, Gain, Directivity, input reflection coefficient.	3
8.	**RADIO WAVE PROPAGATION**	Methods of Propagation: Ground Wave Propagation, Components of ground wave, Field strength dependence on physical factors. Sky wave Propagation; Ionospheres Layers; Virtual Height, Critical Frequency, MUF, Skip distance, Space wave propagation: Tropospheric Scatter, Ducting Super refraction, Sub refraction. Friss Transmission Formula, SNR of a Radio Link. Physical (Medium) effects on Radio wave Propagation: Absorption, Refraction and Radio Horizon, Diffraction, Multipath Propagation and fading, Noise, Doppler Effect.	5

Text Books/ References:

1. Antenna Theory: Analysis & Design, Constantine A. Balanis; Willey, 3rd Edition

2. Antenna (for all application), John D. Kraus and Ronald J. Marhcfka; Tata- MacGraw Hill, 3rd Edition

3. Antenna & Wave Propagation, K.D Prasad; Satya Prakashan, New Delhi, 3rd Edition

4. Antennas and Wave Propagation, A.R. Harish, M. Sachidananda; Oxford.

5. Electromagnetic Waves and Radiating Systems, F. C. Jordan & K. G. Balmain; PHI, 1995 4/e.

6. Antenna & Radio wave Propagation, R. E. Collin; McGraw Hill.

7. Antennas and Wave Propagation, G.S.N. Raju; Pearson.

8. Antenna & Wave Propagation, Sisir Das and Annapurna Das, TMH.

PRACTICAL

Course Title: OPTICAL COMMUNICATION LAB
Course Code: EC131811
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO	AIM OF EXPERIMENT	HOURS
1	To Measure the Numerical Aperture of a given Optical Fiber.	3
2	To Measure the Losses of a given Optical Fiber: a. Attenuation at 650nm b. Attenuation at 850nm c. Bending Loss d. Coupling Loss	3
3	To observe the Electromagnetic/Radio Frequency Interference in a given Optical Fiber.	3
4	Plot the Power Vs Current (P-I) graph and Voltage Vs Current (V-I) graph for an LD (LASER Diode) unit. (Using Power meter and different wavelengths of LD module unit)	3
5	Plot the Power Vs Current graph for an Avalanche Photo Diode (APD) at zero bias.	3
6	To connect the Avalanche Photo Diode in Reverse bias and plot the graph between Voltage(Bias) Vs Load Current	3
7	To study the various Optical Fiber Events with professional OTDR.	3
	Total	21

EC131816	**PROJECT**	L = 0 T = 0 P = 10 C = 5
GUIDELINES WILL BE UPLOADED BY THE UNIVERSITY FROM TIME TO TIME		
EC131821	**COMPREHENSIVE VIVA**	L = 0 T = 0 P = 0 C = 4
GUIDELINES WILL BE UPLOADED BY THE UNIVERSITY FROM TIME TO TIME		