JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
(An Autonomous Institute of Govt. of M.P.)
Affiliated to Rajiv Gandhi Technological University, Bhopal (MP)
Scheme of Study and Examination (w.e.f. July 2010)
B.E. Fourth Year Branch: Electronics & Telecommunication Engg. SEM: Seventh

Course Code	Subject	Periods			EVALUATION SCHEME					Credits
		L	T	P	SESSIONAL EXAM			ESE	SUB TOTAL	
					TA	CT	TOTAL			
EC-41	TV & Digital Display Devices	3	1	-	10	20	30	70	100	4
EC-43	Optical Communication	3	1	-	10	20	30	70	100	4
EC-45	RADAR Engg. & Adv. Antenna	3	1	-	10	20	30	70	100	4
EC-47	Information Theory & Coding	3	1	-	10	20	30	70	100	4
Refer Table	Elective – I	3	1	-	10	20	30	70	100	4
(PRACTICAL/DRAWING/DESIGN)										
EC- 42L	TV & Digital Display Devices Lab	-	-	2	20	-	20	30	50	2
EC-44L	Optical Communication Lab	-	-	2	20	-	20	30	50	2
EC-46L	RADAR Engg. & Adv. Antenna Lab	-	-	2	20	-	20	30	50	2
EC-49L	Major Project Planning	-	-	4	40	-	40	60	100	4
EC-50L	Industrial Training-II*	-	-	2	50	-	50	-	50	2
		15	5	12	200	100	300	500	800	32

*Students will go for Industrial Training after VI semester in the summer vacations and will be assessed in VII semester.

T.A. = Teachers Assessment, CT= Class Test, ESE= End Semester Examination

Total Marks= 800, Total Periods= 32, Total Credits= 32

Elective-I					
EC-048A	1. Image Processing & Pattern Recognition	EC-048B	2. Artificial Intelligence and Neural Network	EC-048C	3.Wireless and Mobile Communication.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**TV & DIGITAL DISPLAY DEVICES**	EC-41	Min "D"	Min "D"	5.0

TV & DIGITAL DISPLAY DEVICES

Unit-I

Basics of T.V. Engineering, Scanning mechanism, interleaved scanning, block diagram of T. V. Transmitter, Image acquisition methods, Basic camera tubes based on photo voltaic, photo emissive , photo conductive phenomenon. Image orthicon and plumbicon camera tubes. Self scanning array, Charge coupled devices for camera. Composite video signals

Unit-II

Basics of T.V. Receiver, Bandwidth calculation. Channel bandwidth & Video bandwidth negative modulation, vestigial side band transmission transmitter and receiving antenna disk antenna,

Unit-III

Color T.V. fundamentals, luminance & chrominance signal in color T.V. camera, working Principle of color T.V. Transmitter and Receiver, subcarrier modulation. Line in precision tube, shadow mask tube, color burst

Unit-IV

Electronics displace devices LED, electro luminance display Electronic paper, E- ink plasma T.V. LCD display in T.V. thin film transistor display, OLED, Surface conduction electronic display LASER TV concept, quantum dot display theory, interferometric modulator display, Three dimensional display, Laser display. Holographic display swept volumetric display, tectile electronic display system for blind

Unit-V

Satellite T.V. Digital video Broadcasting HDTV, SDTV, comparison of Analog and Digital T.V. DTH, set top box fundamentals cable T.V. VSAT, IPTV, Hybrid IPTV, futuristic developments in T.V industry for new Technology

Books

1. TV Engineering by R R Gulati
2. Digital TV by R Rv Gulati

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**OPTICAL COMMUNICATION**	EC-43	Min "D"	Min "D"	5.0

OPTICAL COMMUNICATION

Unit-I

Overview of Optical Fiber Communications (OFC): Motivation, optical spectral bands, key elements of optical fiber systems. **Optical fibers**: basic optical laws and definitions, optical fiber modes and configurations, mode theory for circular waveguides, single mode fibers, graded-index fiber structure, fiber materials, photonic crystal fibers, fiber fabrication, fiber optic cables.

Unit-II

Optical sources: Light emitting diodes (LEDs): structures, materials, quantum efficiency, LED power, modulation of an LED. Laser diodes: modes, threshold conditions, laser diode rate equations, external quantum efficiency, resonant frequencies, structure and radiation patterns, single mode lasers, modulation of laser diodes. **Power launching and coupling**: source to fiber power launching, fiber to fiber joints, LED coupling to single mode fibers, fiber splicing, optical fiber connectors.

Unit-III

Photo detectors: pin photo detector, avalanche photodiodes, photo detector noise, detector response time, avalanche multiplication noise. **Signal degradation in optical fibers:** Attenuation: units, absorption, scattering losses, bending losses, core and cladding losses. Signal distortion in fibers: overview of distortion origins, modal delay, factors contributing to delay, group delay, material dispersion, waveguide dispersion, polarization-mode dispersion. Characteristics of single mode fibers: refractive index profiles, cutoff wavelength, dispersion calculations, mode field diameter, bending loss calculation. Specialty fibers.

Unit-IV Optical receivers: fundamental receiver operation, digital receiver performance, eye diagrams, coherent detection: homodyne and heterodyne, burst mode receiver, analog receivers. **Digital links**: point to point links, link power budget, rise time budget, power penalties. **Analog links**: overview of analog links, carrier to noise ratio, multichannel transmission techniques.

Unit-V

Optical technologies Wavelength division multiplexing (WDM) concepts: operational principles of WDM, passive optical star coupler, isolators, circulators, Active optical components: MEMS technology, variable optical attenuators, tunable optical filters, dynamic gain equalizers, polarization controller, chromatic dispersion compensators. **Optical amplifiers**: basic applications and types of optical amplifiers, Erbium Doped Fiber Amplifiers (EDFA): amplification mechanism, architecture, power conversion efficiency and gain. Amplifier noise, optical SNR, system applications.

Performance Measurement and monitoring: measurement standards, basic test equipment, optical power measurements, optical fiber characterization, eye diagram tests, optical time-domain reflectometer, optical performance monitoring.

References:

1. G. Keiser: Optical Fiber Communications, 4th Edition, TMH New Delhi.
2. J. M. Senior: Optical Fiber Communication- Principles and Practices, 2nd Edition, Pearson Education.
3. G. P. Agarwal: Fiber Optic Communication Systems, 3rd Edition, Wiley India Pvt. Ltd.
4. J. C. Palais: Fiber Optics Communications,5th Edition, Pearson Education.
5. R.P. Khare: Fiber Optics and Optoelectronics, Oxford University Press.
6. A. Ghatak and K. Thyagrajan: Fiber Optics and Lasers, Macmillan India Ltd.
7. S. C. Gupta: Optoelectronic Devices and Systems, PHI Learning.
8. Sterling: Introduction to Fiber Optics, Cengage Learning.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**RADAR ENGINEERING & ADVANCED ANTENNA**	EC-45	Min "D"	Min "D"	5.0

RADAR ENGINEERING AND ADVANCED ANTENNA

Unit-I

Radar Equation, Radar Block Diagram and Operation, Prediction of Range, Minimum Detectable Signal, Receiver Noise, Probability Density Functions, S/N, Integration of Radar Pulses, Radar Cross-section, Transmitter Power, PRF and Range Ambiguities, Radar Antenna Parameters, System Losses and Propagation Effects.

Unit- II

MTI and Pulse Doppler Radar: Introduction, Delay line Cancellers, Moving target Detector, Limitation to MTI performance, MTI from moving platform, Pulse Doppler Radar

Unit- III

Tracking Radar, Sequential Lobing, Conical Scan, Monopulse tracking Radar, Low angle tracking, Pulse compression, Block Diagrams of Synthetic Aperture Radar (SAR), Phased array Radars,.
MST Radar, ECM, ECCM

Unit- IV

Radar Receiver, Mixers, Radar Displays, Receiver Protectors. Principles of Direction Finders, Aircraft Homing and ILS, Radio Altimeter, LORAN, DECCA, OMEGA, Inland Shipping Aids.

Unit- V

Microstrip Antenna, Various types of patch and slot Antenna, Design aspects of microstrip Antenna. Phased array antenna, active electronically steered array(AESA), passive electronically steered array (PESA), Array Effects, array error effects, element patterns & mutual impedance effects.

Text Book:

1. Radar Engineering and Fundamentals of Navigational Aids, G S N Raju, IK International Publishers, 2008
2. Introduction to Radar Systems, Skolnik, McGraw Hill, 2007.
3. Elements of Phased Array, " Robert J. Maillboux"

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**INFORMATION THEORY AND CODING**	EC-47	Min "D"	-	5.0

INFORMATION THEORY AND CODING

Unit-I

Source Coding: A logarithmic measure of information, Average mutual information and entropy, Information measures for continuous random variables, Noiseless coding theorem, Coding for discrete memoryless sources, Discrete stationary sources, The Lampel-Ziv algorithm, Coding for analog sources, rate distortion function.

Unit-II

Channel Capacity and Coding: The converse to the coding theorem, Channel models, Channel capacity, Achieving channel capacity with orthogonal Signals, Channel reliability functions, Random coding based on M-ary Binary-coded signals, Practical Communication systems in light of Shannon's equation.

Unit-III

The Noisy-channel coding theorem: Linear Block codes, The generator matrix and the parity check matrix, Some specific linear block codes, Cyclic codes, Decoding of linear block codes, bounds on minimum distance of the linear block codes.

Unit-IV

Convolutional Codes: Basic properties of the convolutional codes, The transfer function of a convolutional code, Optimum decoding of convolutional codes- The Viterbi algorithm, Distance properties of binary convolutional codes, Other decoding algorithms for convolutional codes, Practical considerations in the application of convolutional codes.

Unit–V

Complex codes based on combination of simple codes: Product codes, Concatenated codes, Turbo codes, The BCJR algorithm.

Coding for Bandwidth-constraint channels: Combined coding and modulation, Trellis coded modulation.

References:

1. Simon Haykins: Communication Systems, 4th Edition, John Wiley.
2. J. G. Proakis: Digital Communications, Mc Graw Hills
3. B. P. Lathi: Modern Analog and Digital Communication System, Oxford University Press
4. R. G. Gallager: Information Theory and Reliable Communication, John Wiley and Sons
5. A. J. Viterbi and J. K. Omura: Principles of Digital Communications and Coding, McGraw Hill Series.
6. U. Madhow: Fundamentals of Digital Communication, Cambridge University Press.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**IMAGE PROCESSING AND PATTERN RECOGNITION**	EC-048A	Min "D"	-	5.0

IMAGE PROCESSING AND PATTERN RECOGNITION

UNIT-I : DIGITAL IMAGE PROCESSING :
Elements of a Digital Image Processing system, Structure of the Human eye, Image formation and contrast sensitivity, Sampling and Quantization, Neighbours of a pixel, Distance measures, Image acquisition Systems, CMOS display demises

UNIT - II : IMAGE ENHANCEMENT :
Definition, Spatial domain methods, Frequency domain methods, Histogram modify technique, Neighborhood averaging, Media filtering, Low pass filtering, Averaging of multiple images, Image sharpening by differentiation and high pass filtering.

UNIT-III : IMAGE TRANSFORMS:
Introduction to Fourier transform-DFT, Properties of two dimensional FT, Separability, Translation, Periodicity, Rotation, Average value, FFT algorithm, Walsh transforms, Hadamard transform, Discrete Cosine transform, Wavelet transform and comparison of all the transforms.

UNIT – IV : IMAGE RESTORATION :
Definition, Degradation model, Discrete formulation, Circulant matrices, Block circulant matrices, Effect of diagnolization of circulant and block circulant matrices, Unconstrained and constrained restorations , Inverse filtering, Wiener filter, Restoration in spatial domain.

UNIT - V : IMAGE ENCODING :
Objective and subjective fidelity criteria, Basic encoding process, Variable length coding, LZW, Bit-plane coding-Bit-plane coding, Lossless predictive coding - Lossy compression: Lossy predictive coding, transform coding, wavelet coding. Image compression. Introduction to all the Image compression techniques and standards, CCITT, JPEG, JPEG 2000, Video compression standards . Basics of Pattern Recognition, image segmentation

References :

1. "Digital Image Processing" by Rafael, C. Gonzlez., and Paul, Wintz, Addison-Wesley Publishing Company.

2. "Fundamentals of Digital Image Processing" by Jain Anil K. Prentice Hall.
3. "Digital Image Processing" by Sosenfeld, and Kak, A.C., Academic Press.
4. The Image Processing Handbook, (5/e), CRC, 2006 by J.C. Russ,
5. Digital Image Processing with MATLAB by . R.C.Gonzalez & R.E. Woods; Prentice Hall, 2003

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**ARTIFICIAL INTELLIGENCE AND NEURAL NETWORK**	EC-048B	Min "D"	-	5.0

ARTIFICIAL INTELLIGENCE AND NEURAL NETWORK

Unit I: Meaning and definition of artificial intelligence, various types of production systems, Characteristics of production systems.

Unit II: Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic, Resolution, refutation, deduction, theorem proving, inferencing, monotonic and non-monotonic reasoning.

Unit III: Probabilistic reasoning, Baye's theorem, semantic networks, scripts, schemas, frames, conceptual dependency, fuzzy logic, forward and backward reasoning.

Unit IV: Game playing techniques like minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding and natural languages processing.

Unit V: Introduction to learning, Various techniques used in learning, introduction to neural networks, applications of neural networks, common sense, reasoning, some example of expert systems.

References:-

- Rich E and Knight K, Artificial Intelligence, TMH New Delhi.
- Nelsson N.J., Principles of Artificial Intelligence, Springer Verlag, Berlin.
  Barr A, Fergenbaub E.A. and Cohen PR. Artificial Intelligence,
- Addison Wesley, Reading Waterman D.A., A guide to Expertsystem,
- Adision - Wesley, Reading
  Artificial Intelligence Hand book, Vol. 1-2, ISA,
- Research Triangle Park. Kos Ko B, Neural Networks and
- Fuzzy system –PHI.
  Haykin S, Artificial Neural Networks-Comprehensive Foundation, Asea, Pearson.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**WIRELESS & MOBILE COMMUNICATION**	EC-048C	Min "D"	-	5.0

WIRELESS & MOBILE COMMUNICATION

Unit - I : Mobile Radio Propagation I: Path Loss and Shadowing

Radio Wave Propagation, Transmit and Receive Signal Models, Free-Space Path Loss, Ray Tracing, Two-Ray Model, Ten-Ray Model (Dielectric Canyon), General Ray Tracing, Local Mean Received Power, Empirical Path Loss Models, The Okumura Model, Hata Model, COST 231ExtensiontoHataModel, Piecewise Linear (Multi-Slope) Model, Indoor Attenuation Factors, Simplified Path Loss Model, Shadow Fading, Combined Path Loss and Shadowing, Outage Probability under Path Loss and Shadowing, Cell Coverage Area.

Unit II : Mobile Radio Propagation II: Statistical Multipath Channel Models

Time-Varying Channel Impulse Response, Narrow band Fading Models, Autocorrelation, Cross Correlation, and Power Spectral Density, Envelope and Power Distributions, Level Crossing Rate and Average Fade Duration, Finite State Markov Channels, Wideband Fading Models, Power Delay Profile, Coherence Bandwidth, Doppler Power Spectrum and Channel Coherence Time, Transforms for Autocorrelation and Scattering Functions, Discrete-Time Model ,Space- Time Channel Models.

Unit –III : Capacity of Wireless Channels

Capacity in AWGN , Capacity of Flat-Fading Channels ,Channel and System Model ,Channel Distribution Information(CDI)Known ,Channel Side Information at Receiver Channel Side Information at Transmitter and Receiver, Capacity with Receiver Diversity Capacity Comparisons, Capacity of Frequency-Selective Fading Channels , Time-Invariant Channels, Time-Varying Channels.

Unit – IV : Diversity

Realization of Independent Fading Paths, Receiver Diversity, System Model, Selection Combining, Threshold Combining, Maximal Ratio Combining, Equal-Gain Combining, Channel Known at Transmitter Channel Unknown at Transmitter-The Alamouti Scheme, Moment Generating Functions in Diversity Analysis, Diversity Analysis for MRC, Diversity Analysis for EGC and SC, Diversity Analysis for Noncoherent and Differentially Coherent Modulation

Unit – V : Wireless system and standards

Global Systems for mobile (GSM), GSM Services and features, GSM system architecture, GSM radio Subsystem, GSM Channel types, Example of GSM call, Frame structure for GSM, Signal processing in GSM, CDMA Digital Cellular Standards (IS-95), Frequency and Channel Specification, Forward CDMA Channel, Reverse CDMA Channel, Third generation systems.

Reference Books:

1. Fundamentals of Wireless Communication: David Tse and Pramod Viswanath
2. Principles of Mobile Communication : Gordon L. Stüber
3. WIRELESS COMMUNICATIONS : Andrea Goldsmith
4. Wireless Communication Principles and Practice : T. S. Rappaport

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**TV & DIGITAL DISPLAY DEVICES LAB**	EC-42L	Min "D"	Min "D"	5.0

TV & DIGITAL DISPLAY DEVICES LAB

LIST OF EXPERIMENTS :

1. To Study Picture Tube.
2. To Study RF Section.
3. To Study VIF Section.
4. To Study Vertical Deflection Section.
5. To. Study Horizontal Deflection Section and EHT Section.
6. To study chroma Section.
7. To Study Video Amplifier.
8. To Study Control System.
9. To Study Sound Section.
10. To Study Switch Mode Power Supply.
11. (a) To study the Transmission characteristics of the different Diode limiter configuration.
    (b) To observe limiting action of sine wave on the C.R.O.
    (c) To study the Diode capacitance at higher frequency.
12. (a) To study R-C differentiating Ckt Response at 1 KHz & 10 KHz for various combination of R & C.
    (b) To study R-C Integrating Ckt Response at 1 KHz & 10 KHz for various combination of R & C.
13. To Study TV pattern Generator.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**OPTICAL COMMUNICATION LAB**	EC-44L	Min "D"	Min "D"	5.0

OPTICAL COMMUNICATION LAB

List of Experiments:

1. Launching of light into the optical fiber and calculate the numerical aperture and V-number.
2. Observing Holograms and their study.
3. Optic version Mach-Zehnder interferometer.
4. Measurement of attenuation loss in an optical fiber.
5. Diffraction using gratings.
6. Construction of Michelson interferometer.
7. Setting up a fiber optic analog link and study of PAM.
8. Setting up a fiber optic digital link and study of TDM and Manchester coding.
9. Measurement of various misalignment losses in an optical fiber.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**RADAR ENGINEERING & ADVANCED ANTENNA LAB**	EC-46L	Min "D"	Min "D"	5.0

RADAR ENGINEERING & ADVANCED ANTENNA LAB

LIST OF EXPERIMENTS

1. To study the variation of field strength of radiated wave, with distance from transmitting antenna.
2. To plot radiation pattern of an omni directional antenna.
3. To plot the radiation pattern of a directional antenna. (Yagi-Uda 3-elements)
4. To study the phenomenon of linear & circular polarisation of antennas.
5. To demonstrate that the transmitting and receiving pattern of an antenna are equal & hence conform the reciprocity of the antennas
6. Study of dipole antenna/ folded dipole antenna & its radiation pattern.
7. Study of Yagi (3ele/4ele) antenna & its radiation pattern
8. Study of Log-periodic antenna & its radiation pattern.
9. Study of Parabolic reflector & its construction & its radiation pattern.
10. Study of Loop antennas, (Quad & Square loop)construction & its radiation pattern.
11. Study of Bioconical antenna , construction & its radiation pattern
12 Study of Horn antenna
13. Study of Rhombic antenna

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**MAJOR PROJECT PLANNING**	EC-49L	-	Min "D"	5.0

MAJOR PROJECT PLANNING

Students will perform literature survey and perform preliminary experimental work for the preparation of major project work of VIII semester. All the work will be supervised by the guide already allotted in VI semester minor project. Student may be permitted for extension of the VI semester minor project with consent of the guide. The work will be evaluated by the guide at the end of the session and marks will be awarded on the basis of individual performance.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE	**INDUSTRIAL TRAINING-II***	EC-50L	-	Min "D"	5.0

INDUSTRIAL TRAINING (4 weeks)

Student shall go to an Industry at the end of Sixth Semester during summer and shall prepare a report on the Practical Training undergone there. Student has to present the report in seventh semester and assessment will be done by committee (headed by HOD with faculty members of the department). Student has to submit a report of 30-40 pages (max) including certificate and cover pages.