Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)

(AICTE Model Curriculum Based Scheme) with Provision for Internship

Bachelor of Technology (B.Tech.) VII Semester (Electronics & Telecommunication Engineering)

w.e.f. July 2024

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	EC701M	PCC	Optical Communication	70	20	10	30	20	150	3	-	2	4
2	EC702M	PCC	CMOS VLSI Design	70	20	10	30	20	150	3	-	2	4
3	EC703M	PCC	Antenna Wave Propagation	70	20	10	30	20	150	3	-	2	4
4	EC704M	PEC	Professional Elective Course-II	70	20	10	-	-	100	3	1	-	4
5	EC705M	OEC	Open Elective Course-III	70	20	10	-	-	100	3	1	-	4
6	EC706M	MC	Industrial Training Evaluation	-	-	-	60	40	100	-	-	4	2
7	EC707M	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	8
			Total	**350**	**100**	**50**	**150**	**100**	**750**	**15**	**2**	**10**	**22**
8	EC708M	MC	NSS/NCC/Swachhata Abhiyan/Rural Outreach	Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum three additional courses in subject code EC707M for the award of Honours (Minor Specialization).									

Note: 01. Departmental BOS will decide list of three/four elective subjects for each PEC and OEC.

02. MOOC/NPTEL subjects shall be taken with permission of HOD/Coordinator

03. Industrial training presentation & viva shall take place in VII Sem. which students have already done in VI Sem.

Professional Elective Course-II		
S.No.	**Subject Code**	**Subject Name**
1	EC704M A	Wireless Communication
2	EC704M B	Information Theory & Coding
3	EC704M C	RFID

Open Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	EC705M A	Digital Image Processing
2	EC705M B	Artificial Intelligence
3	EC705M C	Robotics

PEC: Professional Elective Course (Branch Specific), OEC: Open Elective Course (Interdisciplinary), PCC: Professional Core Course, DLC: Distance Learning Course, MC: Mandatory Course

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

Principal
Jabalpur Engineering College
Jabalpur (M.P.)

DEAN
Academic
JEC, Jabalpur (M.P.)

Jabalpur Engineering College, Jabalpur
(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme) With Provision for Internship
Bachelor of Technology (B.Tech.) VII Semester (Electronics & Telecommunication Engg.)
COURSE CONTENTS **w.e.f. July 2024**

Subject code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz Assignment	End Sem	Lab Work		L	T	P	
EC701M	Optical Communication	70	20	10	30	20	150	3	-	2	4

Module-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.

Module -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. Multimode fibers.

Module -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.

Module-IV Optical receivers: fundamental receiver operation, digital receiver performance, eye diagrams, coherent detection: homodyne andheterodyne, 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.

Module -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. CWDM & DWDM.

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.

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 Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand basics of optical fibers
CO2	Knowledge of various light sources
CO3	Describe various detectors and other theoretical aspects of fibers
CO4	Illustrate various optical receivers
CO5	Elaborate optical technologies

Dr. BHAVANA JHARIA
Prof. & Head ~~Reader~~, Dept. of Electronics
& Telecommunications Engg.
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

DEAN
Academic
JEC, Jabalpur (M.P.)

Jabalpur Engineering College, Jabalpur
(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme) With Provision for Internship
Bachelor of Technology (B.Tech.) VII Semester (Electronics & Telecommunication Engg.)
COURSE CONTENTS **w.e.f. July 2024**

Subject code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz Assignment	End Sem	Lab Work		L	T	P	
EC702M	CMOS VLSI Design	70	20	10	30	20	150	3	-	2	4

Module - I
Introduction to cmos circuits, circuits & system representation Behavioral representation, structural representation. Physical representation MOS transistor theory. NMOS and PMOS enhancement transistor. Threshold voltage body effect. MOS device design equation. Basic DC equation. Second order effect, MOS models.
CMOS inverter – DC character, Static load MOS inverters. The differential inverter Tristate inverter. Bipolar devices, diodes, transistors, BICMOS inverters.

Module - II
Review of silicon semiconductor technology and basic CMOS technology-n- well and p-well process. Interconnect and circuit Twin-tub process layout design rules and latch-up, latch-up triggering and prevention.
Circuit characterization and performance estimation resistance and capacitance estimation, Switching characteristics, CMOS gate transistor sizing, power dissipation. Basic physical design of simple logic gates. CMOS logic structure.

Module – III
CMOS design methods. Design strategies. Programmable logic, programmable logic structure, reprogrammable gate arrays. Xylinx programmable gate array. Algotonix, concurrent logic, sea of gate and gate array design VHDL as a tool.

Module – IV
Single-Stage Amplifier: Basic Concepts, Common Source Stage, Source Follower, Common-Gate Stage, Cascode Stage.
Frequency Response of Amplifiers: General Consideration, Common-Source Stage, Source Followers, Common-Gate Stage, Cascode Stage, Differential Pair.

Module – V
Differential Amplifier: Single-Ended and Differential Operation, Basic Differential Pair, Common-Mode Response, Differential Pair with MOS Loads, Gilbert Cell.
Feedback Amplifier: General Consideration, Feedback Topologies, Effect of Loading, Effect of Feedback on Noise.
Switched-Capacitor Circuits: General Consideration, Sampling Switches, Switched-Capacitor Amplifier, Switched-Capacitor Integrator, Switched-Capacitor Common-Mode Feedback.

Reference Books:

1. Neil, H.E. Wesdte, Kamran Eshraghian, Principles of CMOS VLSI design, Pearson Education.
2. Wyne wolf, Modern VLSI design-system on silicon, Prentics Hall of india
3. Phillip E. Allen and Douglas R holding, CMOS analog Circuit Design, 2nd edition, Oxford University press.
4. B. Razavi: Design of Analog CMOS Integrated Circuits, TMH Publication.
5. Weste, Harris and Banerjee: CMOS VLSI Design, Pearson Education
6. J. M. Rabaey, Digital Integrated Circuits, PHI Learning

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand the working of CMOS and Characterize CMOS Inverter
CO2	Knowledge of CMOS Technology, Estimation of circuit characteristics of CMOS
CO3	Understand various CMOS design methods
CO4	Understand concept of single stage amplifier and its frequency response
CO5	Designing of Differential and feedback amplifier and Switched Capacitor Circuits

CMOS VLSI DESIGN

(Suggested Exercise)

List of Experiments

1. Study of Lambda based and Micron Based Design Rules
2. To design a CMOS Inverter and verify its DC and Transient Characteristics using EDA Tools (Cadence/Mentor Graphics/Tanner/Microwind)
3. To design Logic Gates (AND, NAND,OR, NOR) using EDA Tools
4. Design of Half Adder Full Adder using EDA Tool
5. To design Combinational Circuit implementing logic expressions
6. To design and Simulate following single stage Amplifiers and verify its Frequency response characteristics

    a) CS Amplifier

    b) CG Amplifier

    c) CD Amplifier

7. To Design and Simulate Basic Differential amplifier

Dr. BHAVANA JHARIA
Prof. & Head ~~Reader~~, Dept. of Electronics
& Telecommunications Engg.
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

DEAN
Academic
JEC, Jabalpur (M.P.)

Jabalpur Engineering College, Jabalpur
(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme) With Provision for Internship
Bachelor of Technology (B.Tech.) VII Semester (Electronics & Telecommunication Engg.)
COURSE CONTENTS **w.e.f. July 2024**

Subject code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz Assignment	End Sem	Lab Work		L	T	P	
EC703M	Antenna Wave Propagation	70	20	10	30	20	150	3	-	2	4

Module - I : Introduction to antenna: antenna terminology, radiation, retarded potential, radiation field from current element, radiation resistance of short dipole and half wave dipole antenna, network theorems applied to antenna, self and mutual impedance of antenna, effect of earth on vertical pattern and image antenna.

Module - II : Antenna arrays: of point sources, two element array, end fire and broad side arrays, uniform linear arrays of n-elements, linear arrays with non-uniform amplitude distribution (binomial distribution and Chebyshev optimum distribution), arrays of two-driven half wavelength elements (broad side and end fire case), principle of pattern multiplication.

Module - III :Types of antennas: Babinet's principles and complementary antenna, horn antenna, parabolic reflector antenna, slot antenna, log periodic antenna, loop antenna, helical antenna, biconical antenna, folded dipole antenna, Yagi-Uda antenna, lens antenna, turnstile antenna. Long wire antenna: resonant and travelling wave antennas for different wave lengths, V-antenna, rhombic antenna, beverage antenna, microstrip antenna.

Module - IV : Antenna array synthesis: introduction, continuous sources, methods-Schelknoff polynomial method, Fourier transform method, Woodward- Lawson method, Taylor's method, Laplace transform method, Dolph- Chebychev method, triangular, cosine and cosine squared amplitude distribution, line source, phase distribution, continuous aperture sources. Beam forming.

Module - V : Propagation of radio wave: structure of troposphere, stratosphere and ionosphere, modes of propagation, ground wave propagation, duct propagation. Sky wave propagation: Mechanism of Radio Wave Bending by Ionosphere, critical angle and critical frequency, virtual height, skip distance and LUF, MUF. Single hop and multiple hop transmission, influence of earths magnetic field on radio wave propagation, Fading Space Wave Propagation: LOS, effective earth's radius, field strength of space or tropospheric propagation.

References:

1. J. D. Krauss: Antennas;for all applications, TMH.
2. R. E. Collin, Antennas and Wave Propagation, Wiley India Pvt. Ltd.
3. C. A. Balanis: Antenna Theory Analysis and Design, Wiley India Pvt. Ltd.
4. Jordan and Balmain: Electromagnetic Fields and Radiating System, PHI.
5. A. R. Harish and M. Sachidananda: Antennas and wave propagation, Oxford University Press.
6. K. D. Prasad: Antennas and Wave Propagation, SatyaPrakashan.
7. B. L. Smith: MordernAnteenas, 2nd Edition, Springer, Macmillan India Ltd.

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand various antenna terminologies
CO2	Designing of antenna arrays
CO3	Knowledge of working of various types of antenna
CO4	Synthesize various antenna arrays
CO5	Differentiate between various mechanism of propagation of radio waves

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 polarization 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 Biconical antenna, construction & its radiation pattern
12 Study of Horn antenna
13. Study of Rhombic antenna

Prof. & Head

Dr. BHAVANA JHARIA
~~Reader~~, Dept. of Electronics
& Telecommunications Engg.
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

DEAN
Academic
JEC, Jabalpur (M.P.)

Jabalpur Engineering College, Jabalpur
(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme) With Provision for Internship
Bachelor of Technology (B.Tech.) VII Semester (Electronics & Telecommunication Engg.)
COURSE CONTENTS **w.e.f. July 2024**

Subject code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem	Mid-Sem Exam	Quiz Assignment	End Sem	Lab Work					
EC704M A	Wireless Communication	70	20	10	-	-	100	3	1	-	4

Module-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.

Module-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.

Module-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.

Module-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

Module-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, OFDM and 4G communication.

Reference Books:

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

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand path loss and shadowing in mobile radio propagation
CO2	Describe statistical multipath channel modes
CO3	Knowledge of capacity of various wireless channels
CO4	Analyze the diversity in wireless channels
CO5	Elaborate various wireless systems and standards

Dr. BHAVANA JHARIA
Prof. & Head ~~Reader~~, Dept. of Electronics
& Telecommunications Engg.
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

DEAN
Academic
JEC, Jabalpur (M.P.)

Jabalpur Engineering College, Jabalpur
(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme) With Provision for Internship
Bachelor of Technology (B.Tech.) VII Semester (Electronics & Telecommunication Engg.)
COURSE CONTENTS **w.e.f. July 2024**

Subject code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz Assignment	End Sem	Lab Work		L	T	P	
EC704M B	Information Theory & Coding	70	20	10	-	-	100	3	1	-	4

Module -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.

Module -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.

Module -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.

Module -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.

Module –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, McGraw 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 Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand various source coding algorithms
CO2	Describe channel capacity
CO3	Translate the noisy channel coding theorems
CO4	Describe various convolution codes
CO5	Execute complex codes based on combination of simple codes

Dr. BHAVANA JHARIA
Prof. & Head ~~Reader~~, Dept. of Electronics
& Telecommunications Engg.
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

DEAN
Academic
JEC, Jabalpur (M.P.)

Jabalpur Engineering College, Jabalpur
(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme) With Provision for Internship
Bachelor of Technology (B.Tech.) VII Semester (Electronics & Telecommunication Engg.)
COURSE CONTENTS **w.e.f. July 2024**

Subject code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem.	Mid-Sem. Exam	Quiz Assignment	End Sem.	Lab Work		L	T	P	
EC704M C	RFID	70	20	10	-	-	100	3	1	-	4

Module - I. : Introduction: Automatic Identification Systems, a Comparison of Different ID Systems, Components of an RFID System.
Differentiation Features of RFID Systems: Fundamental Differentiation Features, Transponder Construction Formats, Frequency, Range and Coupling, Information Processing in the Transponder, Selection Criteria for RFID Systems.

Module - II: Fundamental Operating Principles: 1-Bit Transponder, Full and Half Duplex Procedure,Sequential Procedures.
Physical Principles of RFID Systems: Magnetic Field, Electromagnetic Waves, Surface Waves.

Module - III: Frequency Ranges and Radio Licensing Regulations: Frequency Ranges Used, European Licensing Regulations, National Licensing Regulations in Europe, National Licensing Regulations.
Standardization: Animal Identification, Contactless Smart Cards, ISO 69873 — Data Carriers for Tools and Clamping Devices, ISO 10374 — Container Identification, VDI 4470 — Anti-theft Systems forGoods, Item Management.

Module - IV : Coding and Modulation: Coding in the Baseband, Digital Modulation Procedures. **Data Integrity:** The Checksum Procedure, Multi-Access Procedures Anticollision.
Data Security : Mutual Symmetrical Authentication, Authentication Using Derived Keys, Encrypted Data Transfer.

Module - V : Sensors & sensing technology and interfacing Techniques, Transponder with Memory Function, HF interface, Example circuit — load modulation with subcarrier, Example circuit — HF interface for ISO 14443 transponder, Address and security logic, Read-only transponder, Writable transponder, Transponder with cryptological function, Segmented memory, MIFARE_ application directory, MIFARE_ plus, Modern concepts for the dual interface card, Measuring Physical Variables, Transponder with sensor functions, Measurements using microwave transponders, Sensor effect in surface wave transponders.
Readers: Data Flow in an Application, Components of a Reader, Low Cost Configuration — Reader IC U2270B, Connection of Antennas for Inductive Systems, Reader Designs.
Applications: Contactless Smart Cards, Public Transport, Ticketing, Access Control, Transport Systems, Animal Identification, Electronic Immobilization, Container Identification, Sporting Events, Industrial Automation, Medical Applications. Interfacing technology, Zigbee

Textbooks:

1. Klaus Finkenzeller "RFID Handbook" Second Edition John Wiley & Sons Ltd.

2. STEPHEN B. MILES, SANJAY E. SARMA, JOHN R. WILLIAMS"RFID Technology and Applications" Cambridge
University Press 2008.
3. Yan Zhang and Paris Kistos "Security in RFID and sensor networks" CRC press 2009.

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand RFID system and its features
CO2	Describe the fundamental operating principle of RFID system
CO3	Elaborate the used frequency range and the regulations and standardization
CO4	Knowledge of data integrity and data security
CO5	Illustrate the sensors and its interfacing techniques

Bhavana
Prof. & Head ~~Reader~~, Dept. of Electronics
Dr. BHAVANA JHARIA
& Telecommunications Engg.
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

DEAN
Academic
JEC, Jabalpur (M.P.)

Jabalpur Engineering College, Jabalpur
(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme) With Provision for Internship
Bachelor of Technology (B.Tech.) VII Semester (Electronics & Telecommunication Engg.)
COURSE CONTENTS **w.e.f. July 2024**

Subject code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz Assignment	End Sem	Lab Work		L	T	P	
EC705M A	Digital Image Processing	70	20	10	-	-	100	3	1	-	4

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

Module - 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.

Module-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.

Module – 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.

Module - 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 Outcomes:

Upon successful completion of course students will be able to:

CO1	Knowledge of elements of digital image processing system
CO2	Describe about Image enhancement techniques
CO3	Illustrate the Image transforming techniques
CO4	Understand ways for Image restoration
CO5	Elaborate Image encoding techniques

Bhavana

Prof. & Head ~~Reader~~ Dr. BHAVANA JHARIA
Dept. of Electronics
& Telecommunications Engg.
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

DEAN
Academic
JEC, Jabalpur (M.P.)

Jabalpur Engineering College, Jabalpur
(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme) With Provision for Internship
Bachelor of Technology (B.Tech.) VII Semester (Electronics & Telecommunication Engg.)
COURSE CONTENTS **w.e.f. July 2024**

Subject code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem.	Mid-Sem. Exam	Quiz Assignment	End Sem.	Lab Work					
EC705M B	Artificial Intelligence	70	20	10	-	-	100	3	1	-	4

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

Module - 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.

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

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

Module - 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, Free software.

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 Outcomes:

Upon successful completion of course students will be able to:

CO1	Characterize Artificial intelligence system
CO2	Describe knowledge representation in AI systems
CO3	Illustrate reasoning using fuzzy
CO4	Elaborate natural language processing
CO5	Knowledge of neural networks

DEAN
Academic
JEC, Jabalpur (M.P.)

Prof. & Head ~~Reader~~, Dept. of Electronics
Dr. BHAVANA JHARIA
& Telecommunications Engg.
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

Jabalpur Engineering College, Jabalpur
(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme) With Provision for Internship
Bachelor of Technology (B.Tech.) VII Semester (Electronics & Telecommunication Engg.)
COURSE CONTENTS **w.e.f. July 2024**

Subject code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
		Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz Assignment	End Sem	Lab Work		L	T	P	
EC705M C	Robotics	70	20	10	-	-	100	3	1	-	4

Module I
Introduction: Historical development of robots; basic terminology and structure; robots in automated manufacturing, robot configuration space and its topology, degrees of freedom

Module II
Rigid Motions and Homogeneous Transformation: Rotations and their composition; Exponential coordinates; Screw theory; Twists; Euler angles; homogeneous transformations

Module III
Forward Kinematics: Common robot configurations; Product of Exponentials formula; Denavit-Hartenberg convention
Velocity kinematics: Angular velocity and acceleration; The Jacobian
Inverse kinematics: Planar mechanisms; geometric approaches; pseudo inverse; spherical wrist; numerical approaches and Newton-Raphson method

Module IV
Statics of open chains: The use of the Jacobian; singular configurations; manipulability
Kinematics of closed-chains
Robot dynamics: Lagrangian dynamics; Euler-Newton equations for open kinematic chains. Forward and inverse dynamics.

Module V
Trajectory generation: trajectories in space of homogeneous transformations; minimum time trajectories
Feedback control: Actuators and sensors; velocity and torque control; PID control; linearization; feedback linearization
Vision-based control: The geometry of image formation; feature extraction; feature tracking (lab)

Text Books:

1. Lynch and Park, Modern Robotics: Mechanics, Planning, and Control, Cambridge University Press, 2017
2. Robotics, Vision, and Control, Peter Corke, Springer, 2011.
3. Introduction to Robotics, John J. Craig, Addison-Wesley Publishing, Inc., 1989
4. Introduction to Robotics, P. J. McKerrow, ISBN: 0201182408

Course Outcomes:
Upon successful completion of course students will be able to:

CO1	Understand the basics of Robotics technology
CO2	Describe various kind of rigid motions and transformations
CO3	Differentiate between various kinds of Kinematics
CO4	Illustrate Robot dynamics
CO5	Elaborate trajectory generations and controls

DEAN
Academic
JEC, Jabalpur (M.P.)

Prof. & Head
Dr. BHAVANA JHARIA
Reader, Dept. of Electronics
& Telecommunications Engg.
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)