परीक्षा नियंत्रण प्रकोष्ठ, जबलपुर इंजीनियरिंग महाविद्यालय, जबलपुर (म.प्र.)

क्रमांक / प.नि.प्र. / 2024 / 2682 जबलपुर, दिनांक 18 / 10 / 2024

सूचना

महाविद्यालय में अध्ध्यनरत B.Tech. (AICTE) / B.Tech. (PTDC) [AICTE] [Regular/Ex.] विद्यार्थियों को सूचित किया जाता है कि वे नवम्बर 2024 की परीक्षा एवं आगामी सत्र की परीक्षाओं में सम्मिलित होने से पूर्व अपने पेपर / विषय का Equivalence Syllabus महाविद्यालय के पोर्टल से Download कर प्राप्त कर सकते हैं अथवा महाविद्यालय के परीक्षा नियंत्रण प्रकोष्ठ में संपर्क कर सकते हैं। नवम्बर 2024 परीक्षा एवं आगामी सत्र की परीक्षा में उन्हें अपने पेपर / विषय में Equivalence Syllabus में ही सम्मिलित होना है। अतः Equivalence Syllabus की जानकारी न होने की दशा में सम्पूर्ण जिम्मेदारी स्वयं छात्र / छात्राओं की होगी।

Equivalence Syllabus हेतु निम्नानुसार Link का उपयोग कर सकते है:–

https://www.jecjabalpur.ac.in/UploadContent/frm_ViewScheme.aspx

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जबलपुर इंजीनियरिंग महाविद्यालय
जबलपुर

पृ.क्रमांक / प.नि.प्र. / 2024 / जबलपुर, दिनांक / 10 / 2024

प्रतिलिपिः–

01. समस्त विभागाध्यक्ष, जबलपुर इंजीनियरिंग महाविद्यालय, जबलपुर।
02. पीटीडीसी कार्यालय, जबलपुर इंजीनियरिंग महाविद्यालय, जबलपुर।

प्राचार्य / मुख्य परीक्षा नियंत्रक
जबलपुर इंजीनियरिंग महाविद्यालय
जबलपुर

EQUIVALENCE OF SUBJECTS OF DIFFERENT SCHEMES OF UNDER GRADUATE COURSES (B.E. / B.Tech.)
OF ELECTRONICS & TELECOMMUNICATION ENGG.

S.No.	Schemes	Subject Code & Subject Name (Semester) Having Equivalence in Syllabus	Final Subject code & subject (after equivalence)
(i)	(ii)	(iii)	(iv)
1	AICTE	EC303 Signals & Systems **B.Tech. III Sem.**	EC34 Signals & Systems **B.Tech. III Sem.**
	Scheme 2023	EC34 Signals & Systems **B.Tech. III Sem.**	
2	AICTE	EC401 Electromagnetic Theory **B.Tech. IV Sem.**	EC41 Electromagnetic Theory **B.Tech. IV Sem.**
	Scheme 2023	EC41 Electromagnetic Theory **B.Tech. IV Sem.**	
3	AICTE	EC404 Analog Communication **B.Tech. IV Sem.**	EC44 Analog Communication **B.Tech. IV Sem.**
	Scheme 2023	EC44 Analog Communication **B.Tech. IV Sem.**	
4	AICTE	EC502B Industrial Electronics **B.Tech. V Sem.**	EC51B Industrial Electronics **B.Tech. V Sem.**
	Scheme 2023	EC51B Industrial Electronics **B.Tech. V Sem.**	
5	AICTE	EC502C Bio-Medical Instrumentation **B.Tech. V Sem.**	EC51C Biomedical Instrumentation **B.Tech. V Sem.**
	Scheme 2023	EC51C Biomedical Instrumentation **B.Tech. V Sem.**	
6	AICTE	EC503 Digital Communication **B.Tech. V Sem.**	EC52 Digital Communication **B.Tech. V Sem.**
	Scheme 2023	EC52 Digital Communication **B.Tech. V Sem.**	
7	AICTE	EC603 Linear Control Theory **B.Tech. VI Sem.**	EC53 Linear Control Theory **B.Tech. V Sem.**
	Scheme 2023	EC53 Linear Control Theory **B.Tech. V Sem.**	

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S.No.	Schemes	Subject Code & Subject Name (Semester) Having Equivalence in Syllabus	Final Subject code & subject (after equivalence)
8	AICTE	EC602A Satellite Communication **B.Tech. VI Sem.**	EC61B Satellite Communication **B.Tech. VI Sem.**
	Scheme 2023	EC61B Satellite Communication **B.Tech. VI Sem.**	
9	AICTE	EC601C Mobile Standards **B.Tech. VI Sem.**	EC61C Mobile Standards **B.Tech. VI Sem.**
	Scheme 2023	EC61C Mobile Standards **B.Tech. VI Sem.**	
10	AICTE	EC704B Information Theory & Coding **B.Tech. VII Sem.**	EC62B Information Theory & Coding **B.Tech. VI Sem.**
	Scheme 2024	EC704M B Information Theory & Coding **B.Tech. VII Sem.**	
11	Scheme 2023	EC62B Information Theory & Coding **B.Tech. VI Sem.**	
	AICTE	EC602C Robotics **B.Tech. VII Sem.**	EC62C Robotics **B.Tech. VI Sem.**
12	Scheme 2024	EC705M C Robotics **B.Tech. VII Sem.**	
	Scheme 2023	EC62C Robotics **B.Tech. VI Sem.**	
13	AICTE	EC605 Microwave & RADAR Engg. **B.Tech. VI Sem.**	EC65 Microwave & Radar Engg. **B.Tech. VI Sem.**
	Scheme 2023	EC65 Microwave & Radar Engg. **B.Tech. VI Sem.**	
14	AICTE	EC804C Fuzzy Logic & NN **B.Tech. VIII Sem.**	EC71C Fuzzy Logic & Neural Network **B.Tech. VII Sem.**
	Scheme 2023	EC71C Fuzzy Logic & Neural Network **B.Tech. VII Sem.**	

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S.No.	Schemes	Subject Code & Subject Name (Semester) Having Equivalence in Syllabus	Final Subject code & subject (after equivalence)
15	AICTE	EC705A Digital Image Processing **B.Tech. VII Sem.**	EC705M A Digital Image Processing **B.Tech. VII Sem.**
	Scheme 2024	EC705M A Digital Image Processing **B.Tech. VII Sem.**	
16	AICTE	EC804B I.O.T. **B.Tech. VIII Sem.**	EC72B Internet of Things **B.Tech. VII Sem.**
	Scheme 2024	EC802M B IoT **B.Tech. VIII Sem.**	
	Scheme 2023	EC72B Internet of Things **B.Tech. VII Sem.**	
17	AICTE	EC701 T.V. and Digital Display **B.Tech. VII Sem.**	EC73 T.V. & Digital Display Devices **B.Tech. VII Sem.**
	Scheme 2024	EC801M C T.V. and Digital Display **B.Tech. VIII Sem.**	
	Scheme 2023	EC73 T.V. & Digital Display Devices **B.Tech. VII Sem.**	
18	AICTE	EC801 Optical Communication **B.Tech. VIII Sem.**	EC74 Optical Communication **B.Tech. VII Sem.**
	Scheme 2024	EC701M Optical Communication **B.Tech. VII Sem.**	
	Scheme 2023	EC74 Optical Communication **B.Tech. VII Sem.**	
19	AICTE	EC703 Antenna Wave Propagation **B.Tech. VII Sem.**	EC75 Antenna Wave Propagation **B.Tech. VII Sem.**
	Scheme 2024	EC703M Antenna Wave Propagation **B.Tech. VII Sem.**	
	Scheme 2023	EC75 Antenna Wave Propagation **B.Tech. VII Sem.**	

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S.No.	Schemes	Subject Code & Subject Name (Semester) Having Equivalence in Syllabus	Final Subject code & subject (after equivalence)
20	AICTE	EC803D Advance Mobile Communication **B.Tech. VIII Sem.**	EC81A Advance Mobile Communication **B.Tech. VIII Sem.**
	Scheme 2024	EC802M C Advance Mobile Communication **B.Tech. VIII Sem.**	
	Scheme 2023	EC81A Advance Mobile Communication **B.Tech. VIII Sem.**	
21	AICTE	EC803C Sensor Technology **B.Tech. VIII Sem.**	EC81C Sensor Technology **B.Tech. VIII Sem.**
	Scheme 2024	EC801M B Sensor Technology **B.Tech. VIII Sem.**	
	Scheme 2023	EC81C Sensor Technology **B.Tech. VIII Sem.**	
22	AICTE	EC804A Economics & Social Issues **B.Tech. VIII Sem.**	EC82A Economics & Social Issues **B.Tech. VIII Sem.**
	Scheme 2024	EC802M A Economics & Social Issues **B.Tech. VIII Sem.**	
	Scheme 2023	EC82A Economics & Social Issues **B.Tech. VIII Sem.**	
23	AICTE	EC705B Artificial Intelligence **B.Tech. VII Sem.**	EC705M B Artificial Intelligence **B.Tech. VII Sem.**
	Scheme 2024	EC705M B Artificial Intelligence **B.Tech. VII Sem.**	
24	AICTE	EC803A Nano Electronics **B.Tech. VIII Sem.**	EC801M A Nano Electronics **B.Tech. VIII Sem.**
	Scheme 2024	EC801M A Nano Electronics **B.Tech. VIII Sem.**	

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S.No.	Schemes	Subject Code & Subject Name (Semester) Having Equivalence in Syllabus	Final Subject code & subject (after equivalence)
25	Scheme 2018	EC702 CMOS VLSI Design B.Tech. VII Sem.	EC702M CMOS VLSI Design **B.Tech. VII Sem.**
	Scheme 2024	EC702M CMOS VLSI Design B.Tech. VII Sem.	

(Dr. B. Jhansi)
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COURSE CONTENTS **w.e.f. July 2023**

Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
EC34	Signals & Systems	Theory			Practical			L	T	P	4
		End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work					
		70	20	10	30	20	150	3	-	2	

MODULE-I Signals and Systems.

Signals: Classification of signals, Continuous-Time and Discrete-Time Signals, Periodic andAperiodic, Even and Odd,Causal and Non-Causal, Deterministic and Random, Energy andpower signals, Energy Theorem, Power Theorem, Cross-correlation,auto-correlation, ESD, PSD, Singularity Functions.

Systems: Classification of System and Basic System Properties, System with & without memory, inevitability& inversesystem, Causality, Stability, Time-Invariance, Linearity.LTI system: Response, Convolution Integral, Properties & Eigen Function of LTI system, System described by differenceand differential equation.

MODULE-II Fourier analysis of Signals

Fourier series: Fourier series representation of Continuous-Time periodic signals, convergence & properties of Continuous-Time Fourier series, Fourier series representation of Discrete-Time periodic signals, properties of Discrete-Time Fourier series, Fourier series and LTI systems

Fourier transforms: Representation of Aperiodic signals, Continuous-Time Fourier transform, Discrete-Time Fouriertransform, Spectrum plot, Fourier transform of periodic signal, Properties and Applications of Fourier transform(Hilberttransform), Frequency Response of LTI Systems.

MODULE-III Laplace Transform

Laplace transform, Region of Convergence, Inverse Laplace Transform, Properties of LaplaceTransform, Applications of Laplace Transform, Laplace Transform of Some Common Signals,Unilateral Laplace transform, Relation between different transforms.

MODULE-IV Sampling

Sampling theorem, Reconstruction of original signals from its samples, Alising, Anti-alising, Interpolation, Sample & HoldCircuit, Multirate Sampling, Sampling of band-pass signals, Discrete-time processing of Continuous-time Signals,Sampling of discrete time signals.

MODULE-V Z-Transform

Z-Transform, Region of Convergence, Inverse Z-Transform, Properties of Z-Transform, Applications of Z-Transform, Analysis and Characteristic of LTI Systems using Z-Transform, System Function Algebra and Block DiagramRepresentation, Unilateral Z-Transform.

Reference books:

1. Oppenheim, Willsky and Nawab: Signals and Systems, PHI

2. Simon Haykins, B.V.Vean: signals and systems, John Wiley & Sons, Inc.

3. H. P. Hsu: Schaum's Outline of & Systems, MGH

4. David McMahon: Signals and Systems demystified, MGH

5. B.P.Lathi: Linear Systems & Signals, Oxford Series

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Classify various types of Signals and Systems
CO2	Transform signal from time domain to frequency domain
CO3	Analyze various transforming technique
CO4	Convert signal from continuous to discrete form
CO5	Apply various transforming techniques

SIGNAL & SYSTEMS LAB

1. To plot the basic step, ramp and parabolic signal.

2. To plot the signal after applying shifting, compressing and expanding.

3. To plot the signal after time manipulation and frequency manipulation

4. To verify Even and Odd Symmetry of Signals.

5. To check for linearity, causality and stability for a given system

6. To perform sampling rate conversion for any given arbitrary sequence or signal by interpolation, up sampling, down sampling and resampling

7. To find impulse and step response of a given system.

8. Synthesis of signals using Fourier Series.

9. Convolution on Continuous Time Signals.

10. Transformation of signals into time and frequency domains.

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COURSE CONTENTS **w.e.f. July 2023**

Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
EC41	Electromagnetic Theory	Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work		L	T	P	4
		70	20	10	-	-	100	3	1	-	

Course Contents

Module I: Coordinate Systems and Transformation

Cartesian coordinates, circular cylindrical coordinates, spherical coordinates, Vector calculus, Differential length, area and volume, line surface and volume integrals, del operator, gradient of a Scalar, divergence of a vector and divergence theorem, curl of a vector, Green's and Stoke'stheorem, Laplacian of a scalar.

Module II: Electrostatics

Electrostatic fields, Coulombs law and field intensity, Electric fielddue to charge distribution, Electric flux density, Gausses" Law - Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. Electric fleld in material space: Properties of materials, convection and conduction currents, conductors, polarization indielectrics, dielectricconstants, continuity equation and relaxation time, boundary condition.Electrostatic boundary value problems: Poisson's and Laplace's equations, general procedures for solving Poisson's or Laplace's equations, resistance and capacitance, method of images.

Module III: Magnetostatics

Magneto-static fields, Biot-Savart's Law, Ampere's circuit law,Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation,Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magneticdipole, magnetization in materials, magnetic boundary conditions, inductors and inductances,magnetic energy,

Module IV: Waves and Applications

Maxwell's equation, Faraday's law, Transformer and motional electromotive forces, displacement current, Maxwell's equation in final form.

ModuleV: Electromagnetic Wave Propagation

Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.

Text Book

1. Hayt, W.H. and Buck, J.A. 'Engineering Electromagnetics Tata McGraw Hill Pubiishing Co. Ltd., New Delhi Seventh edition.
2. Jordan E.C. and Balmain K.G. 'Electromagnetic' wave and radiating systems. PHI Second edition.
3. Krauss J. D. 'Electromagnetics ' Tata McGraw Hill Fifth edition.
4. Ramo S, Whinnery T.R. and Vanduzer T. 'Field and Waves in CommunicationElectronicsJohn Wiely and Sons Third edition.
5. Elements of Engineering Electromagnetics, N.N. Rao, 5th Edition, PHI.
6. Electromagnetic Waves and Antennas: Collins: TMH

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand different coordinate systems.
CO2	Knowledge of relation between various Laws.
CO3	Understand various boundary conditions.
CO4	Analyze behavior of Electric Field.
CO5	Analyze behavior of Magnetic Field.

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COURSE CONTENTS **w.e.f. July 2023**

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	
EC44	Analog Communication	70	20	10	30	20	150	3	-	2	4

MODULE-I Amplitude Modulation System

Representation of bandpass signals, Frequency Translation, A Method of Frequency Translation, Recovery of Baseband Signal, Amplitude Modulation, Maximum Allowable Modulation, Spectrum of an Amplitude Modulated Signal, Generation and Detection of AM waves. Suppressed Carrier Systems (DSB-SC), Single Sideband Modulation, Vestigial Sideband Modulation, Comparison of various AM Systems, Frequency Division Multiplexing, AM Transmitter and AM Radio Broadcasting.

MODULE-II Angle Modulation System

Angle modulation, Phase & Frequency Modulation, Relation between Phase & Frequency Modulation, Phase & Frequency Deviation, Spectrum of an FM Signal, Features of Bessel Coefficient, Narrowband FM, Wideband FM, Bandwidth of FM Signal, Effect of Modulation Index on Bandwidth, Phasor Diagram of FM signal, FM Generation and Detection, FM Radio Broadcasting.

MODULE-III Random Variables

Random Variables, CDF, PDF, the relation between CDF & PDF, Average Value of RandomVariables, Variance of Random Variable, Tchebycheff's Inequality, Gaussian Probability Density, Error Function, Rayleigh Probability Density, Correlation between Random Variables, Central Limit Theorem, Autocorrelation,

MODULE-IV Random Processes

Description of Statistical Average, Stationary, Random Processes and Linear System, Spectrum of Stochastic Processes, Transmission over LTI System, Gaussian processes. White Power processes, Bandlimited Processes, and Sampling, Bandpass Processes.

Module V Effect of Noise on Analog Communication Systems

Effect of noise on a Baseband Signal, DSB-SC AM, SSB AM, and Conventional System, The PLL, Effect of Additive Noise on Phase Estimation, Threshold effect in Angle Modulation, Pre- Emphasis and De-Emphasis Filtering. Comparison of Analog Modulation System, Characterization of Thermal Noise Sources, Effective Noise Temperature and Noise Figure, Transmission Losses, Repeaters for Signal Transmission.

Reference Books:

1. H.TaubDL.Schilling: Principles of Communication System; TMH
2 Simon Haykins- Communication System; John Wiley
3 B P Lathi- Modern Digital and Analog communication
4.J. Prokis and Salehi- Communication Engineering System, Prentice Hall.
5. Hawaii. P. Hsu- Schaum's Outline of Analog and Digital Communication

Course Outcomes:

Upon successful completion of the course students will be able to:

CO1	Basic concept of signal, Generation and Detection of Analog Modulated Signals.
CO2	Understanding of Angle and Phase Modulation, generation and detection of Frequency modulated signals
CO3	Basic Concepts of Random Variable, its statistical parameter and understanding of CDF and PDF of different distribution
CO4	Basic Concepts of Random Process, itscharacteristics and understanding of Gaussian process.
CO5	Understanding of effect of Gaussian noise for Analog Modulated System

ANALOG COMMUNICATION LAB

(Suggested Exercise)

List of Experiments:

1) Study of AM, DSB - SC & SSB.
2) Study of AM Transmitters.
3) Study of AM Receivers.
4) Study of FM Generation by Armstrong Method.
5) Study of FM Generation by Reactance Modulator.
6) Study of Superheterodyne Receivers.
7) Study of Sampling Theorem and Reconstruction of Bandlimited signal

Evaluation:

Evaluation will be continuous an integral part 0f the class followed by the examination as well as through external assessment.

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand various types of amplitude modulators and demodulators
CO2	Understand various types of frequency modulators and demodulators
CO3	Study various types of transmitters and receiver circuits

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COURSE CONTENTS **w.e.f. July 2023**

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	
EC51B	Industrial Electronics	70	20	10	-	-	100	3	1	-	4

MODULE- I Power Supplies

Power supply, rectifiers (half wave, full wave), performance parameters of power supplies, filters (capacitor, inductor, inductor-capacitor, pi filter), bleeder resistor, voltage multipliers. Regulated power supplies (series and shunt voltage regulators, fixed and adjustable voltage regulators, current regulator), switched regulator (SMPS), comparison of linear and switched power supply, switch mode converter (flyback, buck, boom, buk- boost, cuk converters)

MODULE-II Thyristors

Silicon controlled rectifies (SCR), constructional features, principle of operation, SCR terminology, turn-on methods, turn-off methods, triggering methods of SCR circuits, types of commutation, comparison of thyristors and transistors, thermal characteristics of SCR, causes of damage to SCR, SCR overvoltage protection circuit, series and parallel operation of SCRs, Line commutated converters (half wave rectifier with inductive and resistive load, single phase and three phase full wave rectifiers)

MODULE-III: Other members of SCR family

Triacs, Diacs, Quadracs, recovery characteristics, fast recovery diodes, power diodes, power transistor, powerMOSFET, Insulated gate bipolar transistor (TGBT), loss of power in semiconductor devices, comparisonbetween power power transistor and power IGBT

MODULE-IV Applications of OP-AMP

Basics of OP-AMP, relaxation oscillator, window comparator, Op-comp as rectangular to triangular pulse Converter and vice versa, Wien bridge oscillator, function generator, frequency response of OP-AMP Simplified circuit diagram of OP-AMP, power supplies using OP-AMP, filters (low-pass, high pass) using OP- AMP.

MODULE-V Programmable Logic Controller (PLC)

Functions, applications, advantages and disadvantages of PLC over conventional relay controllers, Comparisonof PLC with process control computer system, factors to be considered in selecting PL.C, functional blockdiagram of PLC, microprocessor in PLC, memory, input and output modules (interface cards), sequence of operations in a PLC, status of PLC, event driven device, ladder logic language, simple process controlapplications of PLC, Programming examples.

Reference Books:

1. Bishwanath Paul: Industrial Electronics and control, PHI Learning
2. Rashid: Power Electronics- Circuits, devices and applications, Pearson Education,
3. Singh and Khanchandani: Power Electronics, TMH
4. Bhimbra Power Electronics, Khanna Publishers.
5. Moorthi: Power Electronics, Oxford University Press.
6. Webb: Programmable Logic Controllers-Principles and Applications, PHI Learning.
7. Petruzulla: Programmable Logic Controllers, TMH

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Describe performance parameters of various electronic circuits (Power supplies, Regulators, Filters,SMPS)
CO2	Understand principle, construction and operation of SCR
CO3	Compare performance and working of other members of SCR family(Diac, Triac, IGBT, Power MOSFET)
CO4	Apply Op-Amp for designing electronic circuits (Oscillators, Comparator, wave shaping, power supply, filters)
CO5	Analyze functioning of PLC and its comparison with process control computer system.

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COURSE CONTENTS **w.e.f. July 2023**

Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
EC51C	Biomedical Instrumentation	Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work		L	T	P	4
		70	20	10	-	-	100	3	1	-	

MODULE-I PHYSIOLOGY AND TRANSDUCERS

Cell and its structure-Resting and Action Potential - Nervous system: Functional organisation of the nervous system-Structure of nervous system, neurons - synapse-transmitters and neuralcommunication - Cardiovascular system-respiratory system - Basic components of a biomedical system - Transducers - selection criteria - Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.

MODULE II ELECTRO-PHYSIOLOGICAL MEASUREMENTS

Electrodes -Limb electrodes-floating electrodes- pregelled disposable electrodes Micro, needle and surface electrodes - Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers - Isolation amplifier. ECG EEG-EMG-ERG-Lead systems and recording methods - Typical waveforms. Electrical safety in medical environment: shock hazards - leakage current-Instruments for checking safety parameters ofbiomedical equipments

MODULE III-NON-ELECTRICAL PARAMETER MEASUREMENTS

Measurement of blood pressure -Cardiac output- Heart rate Heart sound Pulmonary function measurements - spirometer - Photo Plethysmography, Body Plethysmography - Blood Gas analysers: pH of blood-measurement of blood pCO2, pO2, finger-tip oxymeter-ESR, GSRmeasurements.

MODULE IV-MEDICAL IMAGING

Radio graphic and fluoroscopic techniques-Computer tomography - MRI-Ultrasonography- Endoscopy-Thermography - Different types of biotelemetry systems and patient monitoring-

Introduction to Biometric systems

MOSULE V-ASSISTING AND THERAPEUTIC EQUIPMENTS

Pacemakers-Defibrillators - Ventilators-Nerve and muscle stimulators -Diathermy-Heart- Lung machine-Audio meters - Dialysers-Lithotripsy

TEXT BOOKS :

1. R.S.Khandpur, Hand Book of Bio-Medical instrumentation, Tata McGraw Hill Publishing Co Ltd.,2003

2. Leslie Cromwell, Fred J. Weibell, Erich A Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002/PHI

REFERENCE BOOKS :

1. M.Arumugam, 'Bio-Medical Instrumentation", Anuradha Agencies, 2003.

2. L.A. Geddes and LE Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.

3. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.

4. and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation", Universities press (India) Ltd, Orient Longman ltd, 2000.

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Identify and describe operation of biomedical instrumentation and Transducers
CO2	Analyze design parameter of ECG, EEG.
CO3	Study of non electric parameter measurement.
CO4	Understand various Medical Imaging Techniques
CO5	Study of assisting & therapeutic equipments

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COURSE CONTENTS **w.e.f. July 2023**

Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
		Theory			Practical						
EC52	Digital Communication	End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work		L	T	P	4
		70	20	10	30	20	150	3	-	2	

MODULE I

Digital transmission of an analog signal, Sampling theorem, quantization, companding, PAM, PWM, PPM, PCM, DPCM, delta modulation, adaptive delta modulation, delta-sigma modulation, bandwidth requirements of PCM, TDM, noise in PCM, PPM, PWM, DM.

MODULE II

Signaling formats, baseband data transmission in the presence of white Gaussian noise, and pulse shaping. intersymbol interference, Nyquist theorem for pulse shaping raised cosine filters, digital signaling through band-limited channels, synchronization techniques.

MODULE III

Digital modulation formats ASK BFSK, PSK, FSK, MFSK, DPSK.QPSK transmitters, receivers, signals spectrum, bandwidth, constellation diagrams, and M-array data communication systems.

MODULE IV

Binary synchronous data transmission, matched filters, errors probability for matched filter receivers, correlated implementation for the matched filters, Coherent and non-coherent detection of ASK, PSK, BPSK, FSK.

MODULE V

Optimum receivers and signal space concepts, orthonormal representation of signals, binary signal detection, and hypothesis testing, Probability of error calculation, ASK, PSK, FSK. BPSK, MPSK, QAM, Error correction coding.

Text Books:

1. Communication Systems, 4/e, Simon Haykin, John Wiley and Sons.
2. Communication System, A B Carlson, McGraw Hill.

Reference Books:

1. Communication Systems, Ziemmer, Tarner, John Wiley and Sons.
2. Analog and digital communication systems, B P Lathis Oxford University Press.
3. Schaum's outline in analog and digital communication, Hsu, Tata McGraw Hill,
4. Communication systems, Taub, Schitllingm Tata McGraw Hill.

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand different modulation in digital communication
CO2	Discuss and describe signaling, Nyquist theorem, sampling and noise.
CO3	Generate digital modulation signals for ASK, PSK, FSK and perform their detection.
CO4	Analyze and evaluate different types of filter and coherent or noncoherent detection of different shift keying.
CO5	Analyze probability and error calculation in digital communication.

List of Experiments:

1. To demonstrate Time Division Multiplexing and demultiplexing processes using pulse amplitude modulation signals.
2. To analyze a PcM system. and interpret the modulator and demodulator waveforms for a sampling frequency of 4KHz .
3. To analyze a DPCM system and interpret the modulator and demodulator waveforms for a sampling frequency of 8 KHz.
4. To analyze a Delta modulation system and interpret the modulator and demodulator waveforms.
5. To analyze a FsK modulation system and interpret the modulator and demodulator waveforms.
6. To analyze a PSK modulation system and interpret the modulated and demodulated waveforms.
7. To identify the various encoding schemes for a given data stream.
8. To simulate Binary Amplitude shift keying technique using MATLAB software
9. To simulate Binary Frequency shift keying technique using MATLAB software
10. To simulate Binary phase shift keying technique using MATLAB software
11. To simulate Quadrature phase shift keying technique using MATLAB software
12. To simulate Differential phase shift keying technique using MATLAB software

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COURSE CONTENTS **w.e.f. July 2023**

Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
EC53	Linear Control Theory	Theory			Practical			L	T	P	4
		End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work					
		70	20	10	30	20	150	3	-	2	

Module I

Basic Control System Introduction and Classification of control System, open and closed loop systems Linear Control System, Mathematical models of physical systems, Transfer function, Block Diagram Representation, Signal flow Graph, MIMO, Mason's gain formula,Linearization.

Module II

Error Analysis -Effects of Feedback on gain and time constant, pole location, bandwidth,Sensitivity, Disturbance signal, Control over System Standard Test Signals, Time Response of1st Order System, Design of Higher order system, Steady-State Errors and Error coefficients,Constants, Effects of Additions of Poles and Zeros to Open Loop and Closed Loop System.Design Specification of Dynamic first and higher order system, Performance Indices.

Module III

Domain Stability Analysis- Concept of Stability of Linear Systems, Effects of Location of Poles on Stability, Necessary Conditions for Stability, Routh-Hurwitz Stability Criteria, Relative Stability Analysis, Root Locus technique, Experimental determination of transferfunction. Frequency Domain Stability Analysis-Performance Specification in Frequency Domain, Co- relation between frequency Domain and Time Domain, Bode Plot, Minimum-Phase and Non- Minimum Phase System, Polar Plots, Inverse Polar Plot, Nyquist Stability Criterion, Assessment of Relative Stability (Phase Margin, Gain Margin and Stability), Constant-M and N Circle, Nichols Chart.

Module IV

Approaches to System Design, Types of Compensation, Design of Phase-Lag, Phase Lead and Phase Lead-Lag Compensators in Time and Frequency Domain, Proportional, Derivative, Integral and PID Compensation. Modeling of discrete -time systems -sampling -mathematical derivations for sampling sample and hold -Z-transforms-properties -solution of difference equations using Z transforms -examples of sampled data systems -mapping between s plane and z plane

Module V

State variables Analysis and Design- Concept of State Variables and State Model, State Space Representation of Systems, Solution of State Equation, Transfer Function Decomposition, Discrete time system.

Text Books:

1. Ziemer R.E., Tranter W.H. & Fannin D.R., "Signals and Systems", Pearson Education Asia

2 Ogata K., "Modern Control Engineering", Prentice Hall India

3. Nagarath I.J. & Gopal M., "Control System Engineering", Wiley Eastern Ltd.

4. Kuo B.C., "Digital Control Systems", Oxford University Press.

5. Computer-Based Industrial Control. Author, Krishna Kant. Publisher, Prentice Hall India.

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Describe mathematical model of the electrical and mechanical systems and simplifycomplex systems using different graphical techniques in closed and open loop systems.
CO2	Apply time domain analysis and steady state response in control systems
CO3	Analyze Time Domain and frequency domain stability Techniques in control systems
CO4	Design control systems with the desired phase and gain performance.
CO5	Demonstrate the concept of state, state variable and state model and apply this knowledge in steady state analysis automation systems.

List of Experiments:

1. IMPLEMENTATION OF TIME RESPONSE OF A SYSTEM IN MATLAB.
2. STUDY OF ROOT LOCUS PLOT USING MATLAB.
3. PLOTTING BODE PLOTS THROUGH MATLAB.
4. EFFECT OF VARIATION OF K_P , K_D AND K_I OF PID CONTROLLER ON SYSTEM PARAMETERS.
5. STEP RESPONSE OF A SECOND ORDER SYSTEM.
6. FREQUENCY RESPONSE OF A SECOND ORDER SYSTEM.
7. STEP RESPONSE AND FREQUENCY RESPONSE OF A PLANT.
8. TRANSFER FUNCTION MODEL FOR STATE SPACE USING MATLAB.
9. TO STUDY AC SERVO MOTOR AND PLOT ITS TORQUE SPEED CHARACTERISTICS.
10. TO STUDY AC SERVO MOTOR AND PLOT ITS TORQUE SPEED CHARACTERISTICS.

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COURSE CONTENTS **w.e.f. July 2023**

Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
EC61B	Satellite Communication	Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work		L	T	P	4
		70	20	10	-	-	100	3	1	-	

MODULE-I

Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits - Look Angle Determination- Limits of visibility - eclipse-Sub satellite point -Sun transit outage-Launching Procedures launch vehicles andpropulsion.

MODULE II

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control. Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry. Tracking andcommand. Satellite uplink and downlink Analysis and Design, link budget. E/N calculation- performance impairments-system noise. inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.

MODULE III

Modulation and Multiplexing: Voice, Data, Video, Analog - digital transmission system, Digitalvideo Broadcast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression - encryption

MODULE-IV

Earth Station Technology- Terrestrial Interface, Transmitter and Receiver, Antenna SystemsTVRO, MATV, CATV, Test Equipment Measurements on G/T, C/No, EIRP. Antenna Gain.

MODULE V

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GPS, INMARSAT. LEO, MEO. Satellite Navigational System. Direct Broadcast satellites (DBS) Direct to home Broadcast (DTH), Digital broadcast (DAB)- Worldspace services, Business TV(BTV), GRAMSAT, Specialized services- E-mail, Video conferencing, Internet

TEXT BOOKS:

1. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4th Edition, 2006.

2. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, 'Satellite Communication Systems Engineering', Prentice

Hall/Pearson, 2007.

3. Satellite Communication by Dr. P. C. Agarwal, Khanna Publishers 2009

4. Design of Geo synchronous Space craft, PHI 1986

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Identify the fundamental concept of satellite communication, orbits and eclipses.
CO2	Acquire the knowledge to understand the importance of satellite subsystem for link budget analysis
CO3	To Evaluate the significance of various modulation techniques
CO4	To Learn the techniques for analysis of earth station technologies
CO5	To Analyze the working and functionalities of various satellites.

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COURSE CONTENTS **w.e.f. July 2023**

Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
EC61C	Mobile Standards	Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work		L	T	P	4
		70	20	10	-	-	100	3	1	-	

MODULE-I:

Cellular Mobile Wireless Networks: Systems and Design Fundamentals, Propagation Models Description of cellular system, Frequency Reuse, Cochannel and Adjacent channel interference, Propagation Models for Wireless Networks, Multipath Effects in Mobile Communication, Models for Multipath Reception. Evolution of Modern Mobile Wireless Communication System - First Generation Wireless Networks, Second Generation (2G) Wireless Cellular Networks, Major 2G standards, 2.5G Wireless Networks, Third Generation 3G Wireless Networks, Wireless Local Area Networks (WLANs), Cellular-WLAN Integration, AIIIP Network: Vision for 4G

MODULE-II

GSM: Architecture and Protocols - Air Interface, GSM Multiple Access Scheme, GSM Channel Organization, Traffic Channel multiframe, Control (Signaling) Channel Multiframe, Frames, Multi-frames, Super-frames and Hyper-frames, GSM Call Set up Procedure, GSM Protocols and Signaling, Location Update Procedure, Routing of a call to a Mobile Subscriber

2.5G Networks: The General Packet Radio Services: (GPRS) - GPRS Networks Architecture, GPRS Interfaces and Reference Points, GPRS Logical Channel, GPRS Mobility Management Procedures, GPRS Attachment and Detachment Procedures, Session Management and PDP Context, Data Transfer Through GPRS Network and Rout, GPRS Location Management Procedures, GPRS Roaming, The IP Internetworking Model, GPRS Interfaces and Related Protocols, GPRS Applications

MODULE-III

Overview of CDMA systems: IS-95 Networks 3G- The Universal Mobile Telecommunication System (UMTS)- UMTS Network Architecture-Release 99, UMTS Interfaces, UMTS Network Evolution UMTS Release 5, UMTS FDD and TDD, UMTS Channels, Logical Channels, UMTS downlink transport and physical channels, UMTS uplink transport and physical channels UMTS Time Slots, UMTS Network Protocol Architecture, Mobility Management for UMTS Network

MODULE-IV

Overview Mobile Internet Protocol: Basic Mobile IP, Mobile IP Type-MIPV4 and MIPv6, Mobile IP: Concept, Four basic entities for MIPv4, Mobile IPv4 Operations, Registration, Tunneling, MIPv4 Reverse Tunneling, MIPv4 Triangular Routing, Problems and Limitations of MIP, MIPv4 Route Optimization

MODULE-V

Mobility Management Issues: Role of IP on Wireless Networks IP for GPRS and UMTS R99,Protocol Reference Model for UMTS PS domain, Packet Switched Domain Protocol Stacks:Role of Interfaces, The GTP Tunnel, The lu-PS Interface and Mobility Management, Packetrouting and transport of user data in UMTS network, Configuring PDP Addresses on Mobile&Stations, Mobility Management in Wireless Networks, Mobility Classification, Seamless Terminal Mobility Management, Limitations of current TCP/IP networks for mobility support, Mobility solution. Accessing External PDN through GPRS/UMTS PS Domain, Transparent Access, and Use of Mobile IP for Non-transparent access, dynamically accesses IP address from External Network.

References Books:

1. Lee: Cellular and Mobile Telecommunication- Analog & digital systems, TMH

2. Rappaport: Wireless Communications- principles and practice, Pearson Education.

3. Lee: Mobile communications design fundamentals, Wiley India.

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

CO1	To assess the cellular system capacity
CO2	To assess the performance of 2G and 2.5G cellular standards.
CO3	To learn the various modules of CDMA system.
CO4	Acquire various concepts related to mobile protocols
CO5	Learn the concepts require understanding of mobile management issues.

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COURSE CONTENTS **w.e.f. July 2023**

Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
EC62B	Information Theory & Coding	Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work		L	T	P	4
		70	20	10	-	-	100	3	1	-	

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, Channelcapacity, Achieving channel capacity with orthogonal Signals, Channel reliability functions,Random coding based on M-ary Binary-coded signals, Practical Communication systems in lightof 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, Distanceproperties 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 codedmodulation.

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

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COURSE CONTENTS **w.e.f. July 2023**

Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Hours/ Week			Total Credits
EC62C	Robotics	Theory			Practical						
		End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work		L	T	P	4
		70	20	10	-	-	100	3	1	-	

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; pseudoinverse; spherical wrist;numerical approaches and Newton-Raphson method

Module IV

Statics of open chains: The use of the Jacobian; singular configurations; manipulabilityKinematics 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 trajectoriesFeedback 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 UniversityPress, 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 basic terminology structure of Robots and its topology
CO2	Analyze Rigid Motions and Homogeneous Transformation: Rotations and their composition;
CO3	Forward and Inverse kinematics of Common robot, numerical approaches and Newton-Raphsonmethod
CO4	Apply Statics of open chain, manipulability Kinematics of closed-chains, Robot dynamics, Forward and inverse dynamics
CO5	Implement trajectory planning algorithm for straight line motion and executing PID based

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COURSE CONTENTS **w.e.f. July 2023**

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	
EC65	Microwave & Radar Engg.	70	20	10	30	20	150	3	-	2	4

MODULE I

Microwave Components: Rectangular cavity resonators; Q of a cavity resonator, Re-entrant cavities; Slow-wave structure; Microwave hybrid circuits; S-parameters and their properties; Waveguide tees; Hybrid ring: Waveguide corners bends and twists; Two hole directional coupler, S- Matrix; Circulators and Isolators; Hybrid couplers.

MODULE - II

Microwave Linear Beam and Crossed-Field Tubes: Failure of conventional tube at high frequency; Klystron-Velocity modulation; Bunching; output power and loading; Reflex klystron- Velocity modulation; power output and efficiency and electronic admittance; Helix travelling wave tubes; amplification process; Conventional current; Electric field wave modes; Basic principle of coupled cavity; Magnetron-Types and Principles of operation; Modes of oscillation; Strapping; pi-mode separation.

MODULE-III

Microwave Devices: Transistors, Tunnel Diodes and Microwave FETs: Structure; Operation; Characteristics and Power frequency limitations of microwave transistors; Tunnel diodes and Field- Effect Transistors. Transfer Electron Devices: Gunn diode; Gunn Effect; Principle and Mode of operation; Microwave generation and amplification Tunnel Diode; PIN diode and Crystal diode. Modulator, Switches, Avalanche Transit- Time Devices: Physical Structure; Principle of operation; Characteristics; Power output and Efficiency of IMPATT, TRAPATT and BARITT diodes,Parametric amplifiers.

MODULE-IV

Microwave Design Principles. Impedance transformation, Impedance Matching, Microwave FilterDesign, RF and Microwave Amplifier Design, Microwave Power amplifier Design. Low NoiseAmplifier Design, Microwave Mixer Design, Microwave Oscillator Design. Microwave Measurement: Microwave bench; Precautions; Power measurement; Bolometricmethod; Attenuation; VSWR; Impedance, Frequency and Q of the Cavity.

MODULE-V

Principles and Applications of Radar: Basic Radar, Radar Block Diagram, Radar Frequencies, Applications of Radar, Radar Range Equation, MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, delay line cancellers, staggered PRF. Range gated Doppler filter, limitations to MTI performance. Tracking with Radar, Monopulse Tracking. Conical Scan and Sequential Lobing, Limitations to Tracking Accuracy, Low Angle Tracking, Tracking in range, Comparison of Trackers.

Text Books:

1. Microwave Devices and Circuits by Samuel Y. Liao, 3rd Ed., Pearson Education.
2. Foundations of Microwave Engineering by R.E. Collin, TMH Pub.
3. Introduction to Radar Systems by M.I Skolnik, TMH Pub. Co.

Reference Books:

1. Microwave Principles by Reich.
2. Microwaves, Gupta, New Age International Publishers.
3. Microwave and Radar Engg., M. Kulkarni, Umesh Publication.

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Apply concepts of electromagnetic theory to calculate parameters ofwaveguides and transmission lines.
CO2	Design and analyze microwave components and tubes.
CO3	Design and analyze passive and active microwave devices.
CO4	Analyze the designing of microwave filter, microwave amplifier,microwave mixer and microwave oscillator.
CO5	Analyze the principle of radar.

List of Experiments:

1. Study of Microwave Test Bench
2. Study of Gunn Power Supply
3. Study of Klystron Power Supply
4. Study of Microwave VSWR meter.
5. Study of Two cavity Klystron
6. Study of Magic Tee
7. Calculation of parameter for a Given microwave waveguide
8. Calculation of unknown-Impedance using smith chart
9. Design and simulation of E plane Tee/H plane Tee on HFSS/CST

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COURSE CONTENTS **w.e.f. July 2023**

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	
EC71C	Fuzzy Logic & Neural Network	70	20	10	-	-	100	3	1	-	4

MODULE-I: Classical & Fuzzy Sets

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

MODULE-II: Fuzzy Logic System Components

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

MODULE-III: Introduction to Neural Networks

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN. Artificial Neuron Model, Operations of Artificial Neuron. Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN-Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

MODULE-IV: Single and Multi Layer Feed Forward Neural Networks

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications, Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training. Summary of Back propagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

MODULE-V: Applications Neural network applications:

Process identification, control, fault diagnosis and load fore casting Fuzzy logic applications; Fuzzy logic control and Fuzzy classification.

Reference Books:

1. Neural Networks, Fuzzy logic. Genetic algorithms: synthesis and applications by Rajasekharan and Rai - PHI Publication
2. Neural Networks - James A Freeman and Davis Skapura, Pearson Education, 2002.
3. Neural Networks - Simon Hakins, Pearson Education
4. Neural by C.Eliasmith and CH.Anderson, PHI Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications

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Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Introduction to Neural Network
CO2	Differentiate between single and multilayer feed forward neural network
CO3	Discuss classical and fuzzy sets
CO4	Knowledge of fuzzy logic system components
CO5	Illustrate various Neural network application

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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	
EC705M A	Digital Image Processing	End Sem	Mid-Sem Exam	Quiz Assignment	End Sem	Lab Work	100	3	1	-	4
		70	20	10	-	-					

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

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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	
EC72B	Internet of Things	70	20	10	-	-	100	3	1	-	4

MODULE-I:

IoT Introduction and Fundamentals: Deciphering the term IoT. Applications where IoT can be deployed, Benefits/challenges of deploying an IoT, IoT components: Sensors, front-end electronics (amplifiers, filtering, digitization), digital signal processing, data transmission, choice of channel (wired/wireless), back-end data analysis. Understanding packaging and power constraints for IoT implementation

MODULE-II:

Signals, Sensors, Actuators, Interfaces: Sensors: types, signal types, shape and strength, Sensor non-idealities: Sensitivity and offset drift, noise, minimum detectable signal. nonlinearity, Read-out circuits: Instrumentation-amplifier, SNR definition, noise-bandwidth- power trade off, Circuit component mismatch and mitigation techniques (calibration, chopping. auto zeroing etc.), Power/energy considerations, Basic signal processing (filtering, quantization, computation, storage),

MODULE-III:

Networking in IoT: Review of Communication Networks, Challenges in Networking of IoT Nodes, range, bandwidth, Machine-to-Machine (M2M) and IoT Technology Fundamentals, Medium Access Control (MAC) Protocols for M2M Communications, Standards for the IoT, Basics of 5G Cellular Networks and 5G IoT Communications, Low-Power Wide Area Networks (LPWAN), Wireless communication for IoT: channel models, power budgets, data rates, IoT Security and Privacy, MQTT Protocol, Publisher and Subscriber Model

MODULE-IV:

Cloud Computing in IoT Cloud computing platform (open source) and local setup of such environment, embedded software relevant to microcontroller and IoT platforms (enterprise or consumer), user interfaces

MODULE-V:

Data Analysis for IoT applications, Statistics relevant to large data, linear regression, Basics of clustering, classification

Reference Books:

1. S. Vitturi, C. Zunino and T. Sauter, "Industrial Communication Systems and Their Future Challenges: Next-Generation Ethernet, IIoT, and 5G," in Proceedings of the IEEE, vol. 107, no. 6, pp. 944-961, June 2019, doi: 10.1109/JPROC.2019.2913443.

2. F. John Dian, R. Vahidnia and A. Rahmati, "Wearables and the Internet of Things (IoT), Applications, Opportunities, and Challenges: A Survey," in IEEE Access, vol. 8, pp. 69200-69211, 2020, doi: 10.1109/ACCESS.2020.2986329.

3. O. Liberg, M. Sundberg, E. Wang, J. Bergman, J.Sachs, "Cellular Internet of Things: Technologies, Standards, and Performance", Academic Press, ISBN: 978-0-12-812458-1, Oct. 2017.

4. S. Vitturi, C. Zunino and T. Sauter, "Industrial Communication Systems and Their Future Challenges: Next-Generation Ethernet, IIoT, and 5G," in Proceedings of the IEEE, vol. 107, no. 6, pp. 944-961, June 2019, doi: 10.1109/JPROC.2019.2913443.

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand the fundamentals of Internet of things
CO2	Knowledge of interfacing of signal, sensors and actuators in Internet of Things
CO3	Interpret networking in Internet of things
CO4	Implement on Cloud computing in Internet of things
CO5	Analyze the data for various Internet of things applications

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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	
EC73	T.V. & Digital Display Devices	70	20	10	30	20	150	3	-	2	4

Module-I

Fundamentals of television Engineering, Scanning mechanism frequency interleaving aspect ratio kell factor plumbicon, vidicon Image acquisition by CCD, CMOS Camera devices, B/W Picture Tube, Color picture tube principle, Various T. V. Standard.(NTSC CCIRB PAL)

Module-II

Composite Video Signal, Horizontal and Vertical blanking pulses, Calculation of BW in T. V., Vestigial side band transmission, Sound signal transmission, B/W T. V. Transmitter block diagram ad its working ,Color T.V. transmission.

Module-III

B/W T. V. Receiver block diagram and its working. Color T.V. Receivers block Diagram and its working. RF section, IF section in receivers, Video detector, FM sound section. PAL-D system

Module-IV

Basics of color formations in color TV. Luminance signal, Chrominance signal, Negative modulation, Quadrature amplitude modulation. Various kinds of antennas used in T.V. transmission and reception satellite T.V. principle.

Module-V

Digital display method, TFT monitor, LCD, LED, PLASMA display system, High definition TV Flat panel T. V. OLED display, quantum dot display, Holography and 3D TV

Books

1. TV Engineering by R R Gulati
2. A.M. Dhake Television & Video Engineering.
3. For LCD, LED PLASMA "Service manuals of various companies"

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understanding of basics of T.V. and scanning.
CO2	Knowledge of design aspect of video signal BW calculation
CO3	Understand of TV receiver and transmitter
CO4	Comprehensive knowledge of basics of T.V. modulation and Antenna
CO5	Comprehensive study of model Display devices.

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. To Study TV pattern Generator.
12. To Study of flat panel TV receiver.

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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	
EC74	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: 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 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.

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.
3. G. P. Agarwal: Fiber Optic Communication Systems, 3rd Edition, Wiley India Pvt. Ltd.Education.

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

2. Observing Holograms and their study.and calculate the numerical aperture and V-number.

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

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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	
EC75	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, hornantenna, 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 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.

Reference Books:

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. 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, distance from transmitting
2. To plot radiation pattern of an omni directional antenna.
3. To plot the radiation pattern of a directional antenna. (Yagi-Uda 3- elements)antenna.
4. To study the phenomenon of linear & circular polarization of antennas. hence
5. To demonstrate that the transmitting and receiving pattern of an antenna are equal &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

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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	
EC81A	Advanced Mobile Communication	70	20	10	-	-	100	3	1	-	4

Module I:

Mobile Communications Overview: Evolution from 1G to 5G, Analog voice systems in 1G, digital radio systems in 2G, voice and messaging services, TDMA based GSM, CDMA, 2.5G (GPRS),2.75G (EDGE); IMT2000, 3GUMTS, W-CDMA, HSPA, HSPA+, 3G services and data rates, IMT Advanced, 4G, LTE, VoLTE, OFDM, MIMO, LTE Advanced Pro (3GPP Release 13+), IMT2020, enhancements in comparison to IMT Advanced.

Module II:

Introduction to 5G Communication: 5G potential and applications, Usage scenarios, enhanced mobile broad band (eMBB), ultra reliable low latency communications (URLLC), and massive machine type communications (MMTC), D2D communications, V2X communications.

Module III:

5G Radio access technologies: Spectrum for 5G, spectrum access/sharing, millimeter Wave communication, channels and signals/waveforms in 5G, carrier aggregation, small cells, dual connectivity. New Radio (NR), Standalone and non-standalone mode, non-orthogonal multiple access (NOMA).

Module IV:

5G Network: Massive MIMO, beam formation, PHY API Specification, flexible frame structure, Service Data Adaptation Protocol (SDAP), centralized RAN, open RAN, multi-access edge computing (MEC); Introduction to software defined networking (SDN), network function virtualization (NFV), network slicing; restful API for service-based interface, private networks.

Module V:

Current state and Challenges ahead: 5G penetration in developed countries; deployment challenges in low-middle income countries, stronger backhaul requirements, dynamic spectrum access and usage of unlicensed spectrum, contrasting radio resource requirements, large cell usage, LMLC, possible solutions for connectivity in rural areas (BharatNet, TVWS, Long-range WiFi, FSO); non-terrestrial fronthaul / backhaul solutions: LEOs, HAP/UAV.

Text and References Books:

1. Mobile Communications by Jochen Schiller Pub: Financial Times / Imprint ofPearson
2. Mobile Communications Design Fundamentals by William Lee, Pub: Wiley India Pvt.Ltd.
3. Wireless Communications: Principles and Practice by Theodore S. Rappaport, Pub:Pearson
4. Fundamentals of 5G Mobile Networks Jonathan Rodriguez Wiley First Edition.
5. 5G NR: The Next Generation Wireless Access Technology Erik Dahlman, Stefan Parkvall, Johan Skold Elsevier

Course Outcomes:
At the end of this course students will demonstrate the ability to:

CO1	Understand the evolution of mobile communication standards developed over the years.
CO2	Evaluate the use of advanced techniques in cellular communications and understand D2D, MMTC,V2X communication and standardization
CO3	Study the in-depth functioning of 5G radio access technologies.
CO4	Draw and explain 5G architecture, its components and functional criteria
CO5	Understand current issues and future challenges in 5G

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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	
EC81C	Sensor Technology	70	20	10	-	-	100	3	1	-	4

MODULE-I

Sensors Fundamentals and Characteristics, Sensors. Signals and Systems; Sensor Classification; Units of Measurements: Sensor Characteristics

MODULE-II

Physical Principles of Sensing, Electric Charges, Fields, and Potentials; Capacitance; Magnetism; Induction; Resistance; Piezoelectric Effect; Hall Effect; Temperature and Thermal Properties of Material: Heat Transfer; Light; Dynamic Models of Sensor Elements

MODULE-III

Interface Electronic Circuits, Input Characteristics of Interface Circuits, Amplifiers, Excitation Circuits, Analog to Digital Converters, Direct Digitization and Processing, Bridge Circuits, Data Transmission, Batteries for Low Power Sensors

MODULE-IV

Sensors in Different Application Area, Occupancy and Motion Detectors; Position, Displacement, and Level: Velocity and Acceleration; Force, Strain, and Tactile Sensors; Pressure Sensors, Temperature Sensors

MODULE-V

Sensor Materials and Technologies, Materials, Surface Processing, Nano-Technology

Reference Books:

1. J. Fraden, Handbook of Modern Sensors:Physical, Designs, and Applications, AIP Press Springer.
2. D. Patranabis, Sensors and Transducers, PHI Publication, New Delhi.
3. Mechatronics-Ganesh S. Hegde, Published by University Science Press (An imprint of Laxmi Publication Private Limited).

Course Outcomes:

Upon successful completion of course students will be able to:

CO1	Understand sensor fundamentals
CO2	Describe physical principle of sensing
CO3	Interface various Electronic circuits
CO4	Discuss sensors in different application area
CO5	Knowledge of sensor material and technologies

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		Theory			Practical						
		End Sem.	Mid-Sem. Exam	Quiz/ Assignment	End Sem.	Lab work		L	T	P	
EC82A	Economics & Social Issues	70	20	10	-	-	100	3	1	-	4

MODULE-I

Indian Economy on the eve of independence, British Rule and its impact on economy, Population growth its pattern, genders, rural urban literacy, Poverty and inequality agriculture and its productivity Green Revolution, Industrial economy pattern, small scale industries.

MODULE-II

Micro economics, Theory of consumer behavior, Law of diminishing utility. demand and supply, Demand curve, elasticity of demand, Theory of production, Theory of cast.

MODULE-III

National income, Measurement of national income, Measurement of cost of living, Consumption function, investment function, Economics fluctuations GDP, GVP.

MODULE-IV

Concept of public and private goods public budget, optimum budget, plan budget, budget procedure of India, Taxes in India.

MODULE-V

Indian economy policy, population policy antipoverty programmes, NRECA Rishtto employment, MSME, growth, structure EXIM policies.

Reference Books:

1. Mishra &Puri Indian Economy
2. Rana&Verma Macro economics
3. NavendraJadhav, Monetary Policy
4. J. Ray Chellaih, Trends and Issues in Indian Finance

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

CO1	Understanding Indian Economy since independence
CO2	General information about micro Economics, Demand supply Losses
CO3	Compressive Knowledge about GDP and GNP, consumption
CO4	Compressive study of private public systems functioning and taxation systems
CO5	Knowledge about polices of Indian Economy and MSME

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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 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

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Bachelor of Technology (B.Tech.) VIII 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	
EC801M A	Nano Electronics	70	20	10	-	-	100	3	1	-	4

Module-I: Introduction Nanoscale technology: Consequences of the nanoscale for technology and society. Molecular building blocks for nanostructure systems, Nano-scale 1D to 3D structures, Band structure and density of states at low dimensional structure. Size dependent properties (Electrical, mechanical, optical, thermal etc).top down and bottom up technique, lithographic, nanolithographic and nonlithographictechniques:pulsed laser deposition,plasma arc discharge, e-beam sputtering, ball milling, solgel, electrodeposition, chemical vapour deposition.

Module-II : Characterization technique Scanning probe microscopy: (Principle, construction and working;) Scanning tunneling microscope, Atomic force microscope, scanning electron microscope, Transmission electron microscope, Carbon materials :Allotropes of carbon, Structure of Carbon Nanotubes, types of CNTs-, Electronic properties of CNTs, Band structure of Graphene,Band structure of SWNT from grapbene ,electron transport properties ofSWNTs ,

Module-III:Introduction to magnetism and superconductivity Basic magnetic phenomena: paramagnetism, ferromagnetism, ferrimagnetism, anti-ferromagnetism;nano-magnetism; giant and colossal magnetoresistance; ferrofluids. Basic superconductivity phenomena; flux quantization and Josephsoneffects.

Module-IV: Fundamental of nanoelectronics Charging of quantum dots, Coulomb blockade, Quantum mechanical treatment of quantum wells, wires and dots, Widening of bandgap in quantum dots, Strong and weak confinement, spin field effect transistor. single electron transistors, other SET and FET structure.

Module-V: Silicon MOSFETs Silicon MOSFET: fundamental of MOSFET devices, scaling rules, silicon dioxide based gate dielectrics, metal gates , junction and contacts, advanced MOSFET concepts

References:

1.G. W. Hanson: Fundamentals of Nanoelectronics, Pearson Education.
2. K. K. Chattopadhyay and A. N. Banerjee: Introduction to Nanoscience and Nanotechnology, PHI Learning.
3. John H. Davis: Physics of low dimension semiconductor, Cambridge Press.
4.KTu, JW Mayer, LC Feldman, "Electronic Thin Film Science", Macmillan, New York, 1992.
5. Z Cui , "Mico-Nanofabrication", Higher Education press, Springer, 2005.
6.Brian Cantor, "Novel Nanocrystalline Alloys and Magnetic Nanomaterials," Institute of Physics Publications, 2005.

7. S.Chikazumi and S.H. Charap," Physics of Magnetism", Springer-verlag berlin Heideberg, 2005
8.CaoGuozhong, "Nanostructures and Nanomaterials - Synthesis, Properties and Applications", Imperial College Press, 2004.
9. SadamichiMaekawa, "Concepts in Spintronics", Oxford University Press, 2006.

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

CO1	Understand Nanoscale technologies
CO2	Describe various characterization techniques
CO3	Illustrate magnetism and superconductivity
CO4	Knowledge about fundamental of nano electronics
CO5	Elaborate silicon MOSFET

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Jabalpur Engineering College, Jabalpur
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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	
EC702M	CMOS VLSI Design	End Sem	Mid-Sem Exam	Quiz Assignment	End Sem	Lab Work	150	3	-	2	4
		70	20	10	30	20					

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

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