SEMESTER V

S. No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	HS	BA20151	Entrepreneurship Development	3	0	0	3
2	PC	EC20501	Analog and Digital Communication	3	0	0	3
3	PC	EC20502	RF Transmission Lines	3	0	0	3
4	PC	EC20503	Digital Signal Processing	3	1	0	4
5	PC	EC20504	Computer Communication Networks	3	0	0	3
6	PE	EC2015*	Professional Elective I	3	0	0	3
Practical							
7	PC	EC20505	Digital Signal Processing Laboratory	0	0	4	2
8	PC	EC20506	Communication and Networks Laboratory	0	0	4	2
9	EE	EN20501	Career Development Laboratory I	0	0	2	1
			TOTAL	**18**	**1**	**10**	**24**

SEMESTER VI

S. No	Category	Course Code	Course Title	L	T	P	C
Theory							
1	PC	EC20601	Embedded Systems	3	0	0	3
2	PC	EC20602	VLSI Design	3	0	0	3
3	PC	EC20603	Wireless Communication	3	0	0	3
4	PE	EC2025*	Professional Elective II	3	0	0	3
5	PE	EC2035*	Professional Elective III	3	0	0	3
6	OE	EC2090*	Open Elective I	3	0	0	3
Practical							
7	PC	EC20604	Embedded Systems Laboratory	0	0	4	2
8	PC	EC20605	VLSI Laboratory	0	0	4	2
9	EE	EN20601	Career Development Laboratory II	0	0	2	1
			TOTAL	**18**	**0**	**10**	**23**

PROFESSIONAL ELECTIVE I

S. No	Category	Course Code	Course Title	L	T	P	C
1	PE	EC20151	Medical Electronics	3	0	0	3
2	PE	EC20152	Wireless System and Standards	3	0	0	3
3	PE	EC20153	Digital Switching and Transmission	3	0	0	3
4	PE	EC20154	Computer Architecture and Organisation	3	0	0	3

PROFESSIONAL ELECTIVE II

S. No	Category	Course Code	Course Title	L	T	P	C
1	PE	EC20251	Speech Processing	3	0	0	3
2	PE	EC20252	Wireless Networks	3	0	0	3
3	PE	EC20253	Display Technologies	3	0	0	3
4	PE	IT20255	Object Oriented Programming	3	0	0	3

PROFESSIONAL ELECTIVE III

S. No	Category	Course Code	Course Title	L	T	P	C
1	PE	EC20351	Digital Image Processing	3	0	0	3
2	PE	EC20352	Network Security	3	0	0	3
3	PE	EC20353	Nanoelectronics	3	0	0	3
4	PE	IT20355	Artificial Intelligence	3	0	0	3

OPEN ELECTIVE I

S. No	Category	Course Code	Course Title	L	T	P	C
1	OE	EC20901	Consumer Electronics	3	0	0	3
2	OE	EC20902	Principles of Modern Communication Systems	3	0	0	3

BA20151 ENTREPRENEURSHIP DEVELOPMENT 3 0 0 3

COURSE OBJECTIVES

To enable students to

- understand the management principles.
- build the entrepreneurial competencies and analyse the support rendered by government and other agencies in entrepreneurship development.
- understand the business opportunities and to prepare a feasibility report.
- propose a business plan.
- appraise and comprehend the various factors to be considered for launching a small business.

UNIT I Basics of Management: 9

Management: Meaning, Definition, Nature and Importance; Roles of management, Functions of Management, Levels of Management, Functional areas of Management: Marketing, Finance, Production, HRM, IT, Research and Development.

The Evolution and Development of Management Thought: Classical, Neo-classical, System and Contingency Approaches, An Overview.

UNIT II Entrepreneurial Competence and Environment 9

Entrepreneurial Competence: Entrepreneurship, Definition, Role and expectations, Entrepreneurial styles and types, Characteristics of the Entrepreneur, Entrepreneurial Competencies, Functions of an Entrepreneur.

Entrepreneurial Environment: Role of Socio-Cultural, Economic and Political Environment, Institutional Support for small entrepreneurs, Assistance Programme for Small Scale Units, Institutional Framework, Central and State Government Industrial Policies and Regulations.

UNIT III Entrepreneurial Development 9

Ownership Structures, Proprietorship, Partnership, Company, Co-operative, Franchise.

Identification of Business Opportunity, Preparation of Feasibility Report, Financial and Technical Evaluation, Project Formulation, Common Errors in Project Formulation, Specimen Project Report, Entrepreneurial Development Programs, Role of SSI Sector in the Economy, IAS Units, Failure, Causes and Preventive Measures, Turnaround Strategies.

UNIT IV Business Plan Preparation, Financing Ventures 9

Business Plan: Business opportunities-SWOT, Business plan process, Feasibility Study, Functional plan, Marketing plan, Operational plan, Organizational plan, financial plan, Evaluation Criteria.

Financing ventures: sources of raising capital, seed funding, venture capital funding, funding opportunities for start-ups in India.

UNIT V Women Entrepreneurship & Entrepreneurship in various sectors **9**

Women Entrepreneurship: Growth of women Entrepreneurship, Problems faced by Women Entrepreneurs, Development of women Entrepreneurship.

Entrepreneurship in Informal Sector: Rural Entrepreneurship, Entrepreneurship in Sectors like Agriculture, Tourism, Health care, Transport and allied services.

TOTAL PERIODS: 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- implement the necessary managerial skills to become an entrepreneur.
- take up self-employment having been exposed to entrepreneurial environment.
- select a best business idea by using appropriate methods to assess its viability.
- formulate a business plan and deploy the resources for sustainable growth.
- analyse channels and means of launching a small business in any sector.

TEXT BOOKS

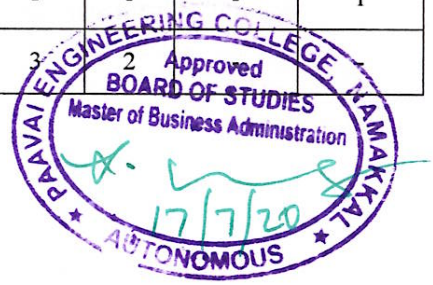
1. Khanka S.S, "Entrepreneurial Development", S. Chand and Company Limited, New Delhi, 2016.
2. Saravanavel. P, "Entrepreneurial Development", Ess Pee Kay Publishing House, Chennai, 2013.

REFERENCES

1. Donald L. Sexton and Raymond W.Smilor, "The Art and Science of Entrepreneurship", Ballinger Publishing Company, 2008.
2. Clifford M.Baumback & Joseph R.Mancuso, "Entrepreneurship and Venture Management", Prentice Hall, 1975.
3. Gifford Pinchot, "Intrapreneuring" Harper & Row Publishers, New York, 2005.
4. Mathew Manimala, "Entrepreneurship Theory at the Crossroads", Paradigms and Praxis, Biztrantra, 2nd Edition, 2015.

CO – PO Mapping:

Mapping of Course Outcomes with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	3	3	-	-	2	-	3	2	1	1	-	-
CO2	-	-	-	-	-	3	3	-	2	-	1	-	-	2
CO3	-	1	2	-	-	-	-	-	-	-	-		1	2
CO4	-	-	-	2	-	-	-	-	-	-	-	-	-	1
CO5	-	-	-	-	-	-	-	2	-	-	3	2	-	-



EC20501 ANALOG AND DIGITAL COMMUNICATION 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the concepts of analog communication techniques
- learn the transition of analog to digital communication techniques
- comprehend the various types of digital communication methods
- know the basics of statistical theory of communication
- be familiar with error control codes and techniques

UNIT I ANALOG COMMUNICATION 9

Modulation - Types, Need for Modulation,Theory of Amplitude Modulation, Double Side Band Modulation, Single side band Modulation,Vestigial Side band Modulation; Theory of Frequency and Phase Modulation; Comparison of Analog Communication Systems - AM, FM, PM

UNIT II ANALOG TO DIGITAL TRANSITION SYSTEMS 9

Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation, Comparison of various Pulse Communication System - PAM, PWM, PPM ; Pulse Code Modulation, Delta Modulation, Differential Pulse Code Modulation.

UNIT III DIGITAL COMMUNICATION 9

Phase shift keying - BPSK, DPSK, QPSK; Principles of M-ary signaling; M-ary PSK, QAM; Comparison, ISI - Pulse shaping - Duo binary encoding - Cosine filters - Eye pattern, equalizers.

UNIT IV INFORMATION THEORY 9

Uncertainty, Information and Entropy, Discrete Memoryless Source, Source Coding Theorem, Shannon Fano Coding, Huffman Coding; Mutual Information, Channel capacity, Channel-Coding Theorem; Information capacity theorem.

UNIT V ERROR CONTROL CODING 9

Need for Coding; Types of Error Correction; Linear block codes - Hamming Codes, Syndrome Decoding; Cyclic codes; Convolutional codes - Code Tree, Code Trellis, Viterbi Algorithm.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- analyze various types of analog communication techniques.
- evaluate analog to digital communication techniques.
- investigate types of digital communication methods.
- apply coding techniques of statistical theory of communication.
- validate various error control coding schemes and techniques.

TEXT BOOKS

1. Simon Haykin and Michael Moher, "Communication systems", John Wiley & Sons, 5th Edition, 2016.
2. Samuel O. Agbo and Matthew O. Sadiku, "Principles of Modern Communication Systems", Cambridge University Press, Cambridge, United Kingdom, 2017.

REFERENCES

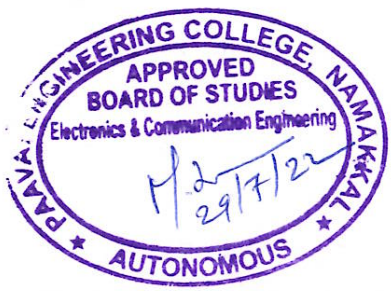
1. Wayne Tomasi, "Advanced Electronic Communication Systems", Pearson Education, 6th Edition, 2009.
2. John G.Proakis, Masoud Salehi, "Digital Communication", 5th Edition, 2008.
3. H.Taub, D L Schilling and G.Saha, "Principles of Communication", Pearson Education, 3rd Edition, 2009.
4. B.P. Lathi and Zhi Ding, Modern Digital and Analog Communication Systems, 4th Edition Oxford University Press, New York, 2009.

CO PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	-	2	-	-	-	-	2	3	3	3
CO2	3	3	1	2	-	1	-	-	-	-	2	3	3	3
CO3	3	3	1	2	-	2	-	-	-	-	2	3	3	3
CO4	3	3	1	3	-	-	-	-	-	-	2	3	3	3
CO5	3	3	1	3	-	-	-	-	-	-	2	3	3	3



EC20502 **RF TRANSMISSION LINES** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- introduce RF networks parameters with the basic knowledge of RF components
- inculcate understanding of the basics required for the design of RF system
- give thorough understanding about transmission line concepts
- impart technical knowledge in impedance matching using Smith chart
- understand the concepts of waveguides and resonators

UNIT I TWO PORT NETWORK THEORY **9**

Review of Low frequency parameters - Impedance, Admittance, Hybrid and ABCD parameters, Different types of interconnection of Two port networks, High Frequency parameters, Formulation of S parameters, Reciprocal and lossless Network, Transmission matrix, RF behavior of Resistors, Capacitors and Inductors.

UNIT II RF SYSTEM CONCEPTS **9**

Active RF components - Semiconductor basics in RF, bipolar junction transistors, RF field effect transistors, High electron mobility transistors; Basic concepts of RF design, Mixers, Low noise amplifiers, transducer power gain, stability considerations.

UNIT III TRANSMISSION LINE THEORY **9**

Transmission line equations - Wavelength and velocity of Propagation- Input and transfer impedance; Line distortion - Distortion-less Line Loading; Open and short-circuited lines; Reflection coefficient, Reflection factor, Reflection loss.

UNIT IV IMPEDANCE MATCHING AND TRANSFORMATION **9**

Reflection Phenomena - Standing waves, nodes - $\lambda/8$, $\lambda/4$, $\lambda/2$ lines; Stub Matching - Single, Double Stub; Smith Chart and Applications - Solutions of problems using Smith chart.

UNIT V WAVEGUIDES AND RESONATORS **9**

Excitation of waves in Parallel planes - TE, TM and TEM mode of propagation in Rectangular and circular waveguides, Rectangular and circular cavity resonators- Q-factor.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- synthesis the multi- port RF networks
- explain microwave devices, components used in RF systems.
- explain the characteristics of transmission lines and examine the propagation of signals through transmission lines.

- analyze impedance matching by stubs using smith charts.
- apply the concepts of radio propagation in guided systems, evaluate waveguides and cavity resonators.

TEXT BOOKS

1. Reinhold Ludwig and Gene Bogdanov, "RF Circuit Design: Theory and Applications", Pearson Education Inc., 2011
2. John D Ryder, "Networks, lines and fields", 2nd Edition, Prentice Hall India, 2010.

REFERENCES

1. Mathew M Radmanesh, "RF and Microwave Electronics", Prentice Hall, 2000.
2. Devendra.K. Misra," Radio Frequency and Microwave communication Circuits - Analysis and Design", John Wiley and Sons, Newyork, 2004.
3. G.S.N Raju, "Electromagnetic Field Theory and Transmission Lines" Pearson Education, First Edition 2005.
4. E.C.Jordan and K.G. Balmain, Electromagnetic Waves and Radiating Systems Prentice Hall of India, 2006.

CO PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes: **(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak**														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	2	-	3	-	-	-	-	2	-	3	3
CO2	3	3	2	2	-	-	-	-	-	-	2	-	3	3
CO3	3	3	2	2	-	3	-	-	-	-	2	-	3	3
CO4	3	3	3	1	-	-	-	-	-	-	2	-	3	3
CO5	3	3	3	1	-	3	-	-	-	-	2	-	3	3

EC20503 **DIGITAL SIGNAL PROCESSING** **3 1 0 4**

COURSE OBJECTIVES

To enable the students to

- infer the concepts of discrete Fourier transform, properties of DFT and FFT algorithms
- know the characteristics and design of IIR filters
- understand the characteristics of FIR filters for filtering the undesired signals
- impart knowledge on the effects of finite word length
- inculcate the concepts of digital signal processors and its implementation

UNIT I DISCRETE FOURIER TRANSFORM AND FAST FOURIER TRANSFORM 12

Review of DFT - Properties of DFT, Relation between DTFT and DFT, FFT algorithms - Radix-2 FFT algorithm, Decimation in time, Decimation in frequency algorithms; Linear and circular convolution - Overlap add and save methods.

UNIT II INFINITE IMPULSE RESPONSE FILTERS 12

Characteristics of practical frequency selective filters - Characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters; Design of IIR filters from analog filters - LPF, HPF, BPF, BRF; Approximation of derivatives, Impulse invariance method, Bilinear transformation, Frequency transformation in the analog domain; Structure of IIR filter - Direct form I, Direct form II, Cascade, Parallel realizations.

UNIT III FINITE IMPULSE RESPONSE FILTERS 12

Design of FIR filters - Symmetric and Anti-symmetric FIR filters, Design of linear phase FIR filters using Fourier series method; FIR filter design using windows - Rectangular, Hamming and Hanning window; Frequency sampling method; FIR filter structures - Linear phase structure, Direct form realizations.

UNIT IV FINITE WORD LENGTH EFFECTS 12

Fixed point and floating-point number representation - ADC, quantization, truncation and rounding; Quantization noise - Input and Output Quantization, Coefficient quantization error, Product quantization error, Overflow error; Limit cycle oscillations - scaling to prevent overflow.

UNIT V DSP PROCESSORS AND ITS IMPLEMENTATION 12

Introduction to programmable DSPs - TMS320C67xx, Architecture of C67X, C67X buses, Memory organization, CPU, ALU; Barrel shifter - Multiplier/adder unit, addressing modes, instruction set, application programs; Applications of DSP processors.

TOTAL PERIODS 60

COURSE OUTCOMES

At the end of the course, the students will be able to

- able to solve DFT omputations using FFT method.
- solve design problems in IIR filters.
- analyze the design of FIR filters.

- apply the concepts of finite word length effects in DSP processors.
- implement DSP algorithms in DSP processors.

TEXT BOOKS

1. John G. Proakis & Dimitris G. Manolakis, "Digital Signal Processing - Principles, Algorithms & Applications", Fourth edition, Pearson Education / Prentice Hall, 2014.
2. Dr.B.Venkataramani, M.Bhaskar, "Digital signal Processors:Architecture, Programming and Applications", Second edition,Tata Mc Graw Hill, 2010.

REFERENCES

1. A. V. Oppenheim, R.W. Schafer and J.R. Buck, "Digital Signal Processing" First Edition, Pearson, 2015.
2. P. Ramesh Babu "Digital Signal Processing"- Sixth Edition- Scitech-2015.
3. Emmanuel C. Ifeachor & Barrie. W. Jervis, "Digital Signal Processing", Second edition Pearson Education / Prentice Hall, 2002.
4. Sanjit K. Mitra, "Digital Signal Processing - A Computer Based Approach", Tata Mc Graw Hill, 2007.

CO PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	-	-	-	-	-	-	-	3	3
CO2	3	2	2	2	2	-	-	-	-	-	-	-	3	3
CO3	3	2	2	2	2	2	2	-	-	-	-	-	3	3
CO4	3	2	2	2	2	-	-	-	-	-	-	-	3	3
CO5	3	2	2	2	2	2	2	-	-	-	-	-	3	3

EC20504 COMPUTER COMMUNICATION NETWORKS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the network functionalities of different layers.
- be familiar with flow and error control protocols and its techniques
- know about the routing protocols
- acquire knowledge on congestion control algorithms and Quality of Service
- acquaint knowledge about various application layer protocols with its security features.

UNIT I DATA COMMUNICATION AND PHYSICAL LAYER 9

Data Communication - Components, Data flow ; Networks - Criteria, Physical Structure, Topology; OSI Model; Transmission Impairment; Transmission media - Guided media, twisted pair cable, Coaxial cable, Fiber optic cable; Unguided media; Switching - Circuit switching networks, Packet switching networks.

UNIT II DATA LINK LAYER 9

Data Link - Services; Framing; Noiseless Channels - Noisy channel protocols; PPP; HDLC; CSMA/CD, CSMA/CA; IEEE 802.3; IEEE802.11; Bluetooth.

UNIT III NETWORK LAYER 9

Network Layer - Services, Performance; IPV4 addresses; Classful Addressing;Classless Addressing; ARP, RARP, DHCP, ICMP; IGMP; IPV6; Routing algorithm - Distance Vector Routing, Link State Routing; Unicasting - RIP, OSPF; Multicast routing - DVMRP, PIM.

UNIT IV TRANSPORT LAYER 9

Transport Layer - Services; Connectionless and Connection Oriented Protocols; Port Numbers; UDP; TCP - Flow Control, Error Control, TCP Congestion control; QoS - Token bucket and Leaky bucket.

UNIT V APPLICATION LAYER AND NETWORK SECURITY 9

Domain Name Space; E-Mail-SMTP, POP, IMAP; WWW; HTTP; Network Security - Categories-Symmetric Key Cryptography, Asymmetric-Key Cryptography.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- analyze the different types of layers in a network
- elaborate flow and error control techniques to send data in a network
- explain the various routing algorithms of network layer
- synthesize the congestion control techniques
- elucidate about the various applications and security issues

TEXT BOOKS

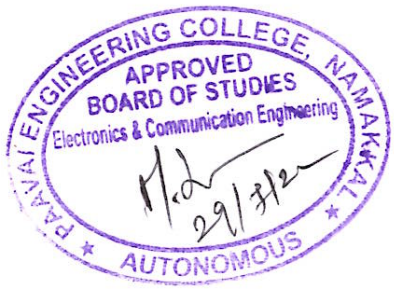
1. Behrouz A. Foruzan - "Data communications and Networking"- The McGraw-Hill Companies - Inc.5th edition, 2013.
2. William Stallings - "Data and Computer Communications" - 10th Edition, Pearson Education, 2015.

REFERENCES

1. Andrew S.Tannenbaum - "Computer Networks"- Prentice Hall, 2010.
2. James F. Kurose & Keith W. Ross - "Computer Networking - A Top-down Approach Featuring the Internet" Prentice Hall, 2013.
3. Larry L. Peterson & S. Peter Davie - "Computer Networks" - Harcourt, 2008.
4. Nader F. Mir, "Computer and Communication Networks", Second Edition, Prentice Hall, 2014.

CO PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes: **(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak**														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	-	-	-	-	-	2	-	2	3	3	3
CO2	3	2	2	-	-	-	-	-	2	-	2	3	2	3
CO3	3	3	2	3	-	-	-	-	2	-	2	3	3	3
CO4	3	3	2	-	-	-	-	-	2	-	2	3	3	3
CO5	3	2	2	-	-	-	-	-	2	-	2	3	2	3



EC20505 **DIGITAL SIGNAL PROCESSING LABORATORY** **0 0 4 2**

COURSE OBJECTIVES

To enable the students to

- generate the basic types of signals using SCILAB
- practice Linear and Circular Convolution using MATLAB
- understand concepts of FIR and IIR filters
- know the generation and convolution of signals using DSP processors

LIST OF EXPERIMENTS: MATLAB /SCILAB / EQUIVALENT SOFTWARE PACKAGE

1 Generation of Signals using SCILAB.
2 Linear Convolution
3 Circular Convolution
4 Spectrum Analysis using DFT
5 FIR filter design
6 IIR filter design

DSP PROCESSOR TMS320C5X/TMS320C 67XX BASED IMPLEMENTATION

7 Study of Digital Signal Processor architecture
8 Waveform generation
9 Linear convolution
10 Circular convolution

TOTAL PERIODS 60

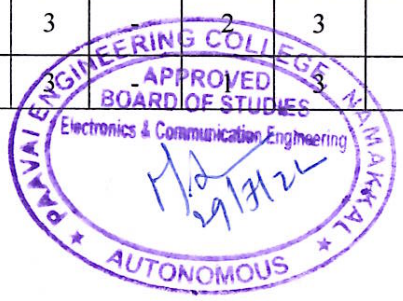
COURSE OUTCOMES

At the end of the course, the students will be able to

- simulate basic types of signals using SCILAB.
- demonstrate Linear and Circular Convolution using MATLAB.
- design different FIR and IIR filters.
- implement generation and convolution usingTMS320C5X/TMS320C 67XX DSP processors.

CO PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	3	2	3	-	-	-	3	-	2	3	3	3
CO2	3	2	3	2	3	-	-	-	3	-	1	3	3	3
CO3	3	2	3	2	3	-	-	-	3	-	2	3	3	3
CO4	3	2	3	2	3	-	-	-	3	-	1	3	3	3



EC20506 COMMUNICATION AND NETWORKS LABORATORY 0 0 4 2

COURSE OBJECTIVES

To enable the students to

- understand the concept of sampling, analog modulation and digital modulation schemes
- identify the methods for error control
- practice the different ARQ protocols for error free transmission
- know the routing algorithms

LIST OF EXPERIMENTS: (MATLAB/SIMULINK/NETSIM)

1 Verification of sampling theorem and Simulation of Time Division Multiplexing
2 Simulation of Amplitude Modulation and Frequency Modulation
3 Simulation of Pulse Amplitude Modulation and Pulse Width Modulation
4 Simulation of ASK, PSK and DPSK schemes
5 Simulation of signal constellations of BPSK, QPSK and QAM
6 Simulation of Error control coding schemes - Linear Block Codes
7 Implementation and study of stop and wait protocol
8 Implementation and study of Go back-N and selective repeat protocols
9 Implementation of Data encryption and decryption
10 Implementation of Link state routing algorithm

TOTAL PERIODS 60

COURSE OUTCOMES

At the end of the course, the students will be able to

- verify sampling theorem, analog modulation and digital modulation schemes.
- simulate and verify error control schemes.
- implement ARQ protocols.
- generate the shortest path route in the network.

CO PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes:

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak

COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	-	-	-	3	-	-	3	3	3
CO2	3	3	3	3	3	-	-	-	2	-	-	2	3	3
CO3	3	3	3	3	2	-	-	-	3	-	-	2	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	3	3	3

EN20501 **CAREER DEVELOPMENT LABORATORY I** **0 0 2 1**

COURSE OBJECTIVES

To enable students to

- enhance their writing skills.
- evaluate their presentation skill to face the corporate world.
- solve the quantitative aptitude problems and improve their mental ability.
- improve the critical thinking and reasoning skills.

UNIT I **WRITING SKILLS** **6**

Writing Skills: The Essentials of Writing – The Importance of Structure – Types of Writing – Common Mistakes in Writing

Activities: Email Writing - Paragraph writing – Report Writing – Story Writing - Story Telling Session: 2 – JAM Session 1

UNIT II **PRESENTATION SKILLS AND GROUP DISCUSSION** **6**

Presentation Skills: Types of Presentation– Methods of Delivering Presentation –Ways to improve the Presentation – Presentation Aids; Group Discussion: Introduction –Types and Importance – Why GD – Types of GD- Evaluation Criteria – Do's and Don'ts of GD

Activities: Presentation Session I ,Group Discussion Session I, Role Play Session (Team): Level II – Personality Profile Session II – Company Profile Analysis Session II

UNIT III **QUANTITATIVE APTITUDE** **6**

Simplification – Cubes and Cube Roots – Squares and Square Roots – Boats and Streams – Trains – Profit and Loss – Pipes and Cisterns

UNIT IV **LOGICAL REASONING - I** **6**

Series Completion – Letter Series – Symbol Series – Number Series – Arithmetic Reasoning

UNIT V **LOGICAL REASONING - II** **6**

Blood Relations – Seating Arrangement - Character Puzzle

TOTAL PERIODS: 30

COURSE OUTCOMES

At the end of the course, the students will be able to

- excel in drafting mails and speaking
- demonstrate the participative skills in group discussions.
- solve problems based on quantitative aptitude.
- enhance their logical and verbal reasoning.

TEXTBOOKS

1. Agarwal, R.S." a modern approach to Verbal and Non Verbal Reasoning", S.Chand & Co Ltd, New Delhi.2015.
2. Agarwal, R.S. "Objective General English", S.Chand & Co.2016.

REFERENCES

1. Abhijit Guha, "Quantitative Aptitude ", Tata-Mcgraw Hill.2015.
2. Word Power Made Easy By Norman Lewis ,Wr.Goyal Publications.2016.
3. Johnson, D.W. Reaching out – Interpersonal Effectiveness and self actualization. Boston: Allyn and Bacon. 2019.
4. Infosys Campus Connect Program – students' guide for soft skills.2015.

CO/PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
CO's	**Programme Outcomes (PO's)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	3	3	1	-	-	-	-	-	-	3	2
CO2	-	2	3	-	2	-	2	-	-	-	-	-	3	2
CO3	3	2	2	-	-	1	-	-	-	-	2	-	2	3
CO4	2	3	3	2	1	3	3	1	-	1	2	-	2	3

EC20601 **EMBEDDED SYSTEMS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- understand the overview of Embedded System Architecture.
- know the process of Embedded system development.
- Infer the basic concepts of Real Time Operating System.
- be familiar with software development tools.
- acquaint knowledge about the concepts of embedded applications.

UNIT I ARCHITECTURE OF EMBEDDED SYSTEMS **9**

Categories of Embedded Systems - Specifications of Embedded Systems, Recent trends in Embedded Systems; Hardware Architecture - Software Architecture; Communication Software - Process of generation of executable image , development/testing tools.

UNIT II PROCESS OF EMBEDDED SYSTEM DEVELOPMENT **9**

Development Process; Requirements Engineering Design; Implementation; Integration and Testing Packaging; Configuration Management - Managing Embedded System Development Project; Design trade-offs due to process compatibility.

UNIT III REAL - TIME OPERATING SYSTEMS CONCEPTS **9**

Architecture of the Kernel - task and task Scheduler, Interrupt Service Routines; DMA and DMA controllers, Semaphores, Mutex Mailboxes, Message Queues, Event Registers, Pipelining, Signals; Timers-Memory Management; Priority Inversion Problem - Co-processors and Hardware Accelerators; Inter-process Communication.

UNIT IV SOFTWARE DEVELOPMENT TOOLS **9**

Software Development environment - IDE, assembler, compiler, linker, simulator, debugger, in-circuit emulator; Target Hardware Debugging, Need for Hardware - Software Partitioning and Co-Design; Overview of UML, Scope of UML modelling;

UNIT V APPLICATIONS OF EMBEDDED SYSTEMS **9**

Data compressor; Software modem; Digital still camera; Telephone answering machine;Engine control unit; Video accelerator; Washing Machine;Set-top Box, Inkjet Printer.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- describe the hardware and software architectures of Embedded Systems.
- distinguish the devices and buses used for Embedded Networking
- interpret the concepts of a Real Time Operating System.

- elucidate the special features of software development tools.
- implement real-time applications using embedded-system concepts.

TEXT BOOKS

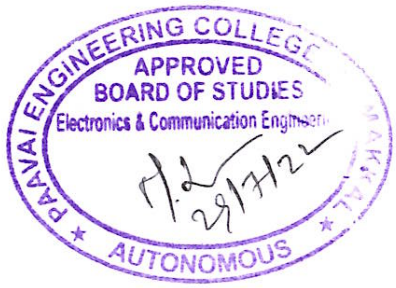
1. K.V.K.K. Prasad "Embedded /Real-Time Systems: Concepts, Design and Programming" Wiley 2016.
2. Raj Kamal, "Embedded Systems Architecture Programming and Design", Second Edition, McGraw Hill, 2017

REFERENCES

1. Andrew N. Sloss, Dominic Symes, Chris Wright, "ARM System Developers Guide Designing and Optimizing system Software", Morgan Kaufmann Publishers, Elsevier, 2014.
2. Jonathan W. Valvano, "Embedded Microcomputer Systems Real Time Interfacing", Third Edition Cengage Learning, 2012.
3. David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth Impression, Addison Wesley Professional, 2017
4. Wolf, W. "Computers as Components - Principles of embedded computing system design", Second edition, Academic Press, 2008

CO PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes: (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium , 1-Weak														
COs	**Programme Outcomes(POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	2	-	-	-	-	-	-	1	2	3	2
CO2	3	2	2	3	-	-	-	-	-	-	-	2	2	3
CO3	3	3	2	2	-	-	-	-	-	-	1	2	3	2
CO4	3	2	2	2	-	-	-	-	-	-	-	2	2	3
CO5	3	3	2	2	-	-	-	-	-	-	1	2	3	2



EC20602 **VLSI DESIGN** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- understand the MOS circuit realization and various processing technologies.
- identify the transistor circuit level design and realization for digital operation.
- learn the circuit characteristics and performance estimation.
- recognize the knowledge about various VLSI system components.
- acquire the basics of Verilog in different types of Modeling.

UNIT I MOS TRANSISTOR THEORY AND PROCESS TECHNOLOGY **9**

NMOS and PMOS transistors ; Threshold voltage ; Body effect ; MOS device design equations-Second order effects; Small signal AC characteristics ; Basic CMOS Technology.

UNIT II INVERTERS AND LOGIC GATES **9**

NMOS and CMOS inverters; Stick diagram; Inverter ratio; DC characteristics - Transmission gates; CMOS logic structures - Static CMOS design - Dynamic CMOS design.

UNIT III CIRCUIT CHARACTERISATION AND PERFORMANCE ESTIMATION **9**

Resistance estimation; Capacitance estimation; Switching characteristics - Transistor sizing,,Design margining; Charge sharing - scaling.

UNIT IV VLSI SYSTEM COMPONENTS **9**

Architectures of ripple carry adder-carry look ahead adder; High speed adders-carry select adder carry save adder; Multipliers; Barrel shifter; Speed and area trade off.

UNIT V SPECIFICATION USING VERILOG HDL **9**

Overview of digital design with Verilog HDL - VLSI design flow, operators; Gate level modeling, Data flow modeling, Behavioral modelling; HDL programs for simple combinational and sequential circuits.

TOTAL PERIODS **45**

COURSE OUTCOMES

At the end of the course, the students will be able to

- apply the basic concepts of MOS transistor logic.
- compare different CMOS designs.
- distinguish the performance of CMOS circuits.
- exercise the CMOS logic to design various digital modules for VLSI system design.
- work on modeling concepts of hardware description language.

TEXT BOOKS

1. Neil.H.E Weste David Harris -"CMOS VLSI Design: A Circuits and Systems Perspective", 4th Edition, Pearson Addison Wesley, 2015.
2. Wayne Wolf - "Modern VLSI Design System on chip"- Pearson Education - 2012.

REFERENCES

1. John P. Uyemura - "Introduction to VLSI Circuits and Systems"- John Wiley and Sons,2016
2. Kamran Eshraghian, Douglas A. Pucknell - "Essentials of VLSI Circuits and Systems", Prentice Hall of India, 2015
3. Keng,Lable bick - "CMOS Digital Integrated Circuits", Tata McGraw Hill, 2014.
4. Bhasker J - "A Verilog HDL Primer"- 2nd Edition,B. S. Publications, 2001.

CO PO MAPPING:

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CO2	3	3	3	-	3	-	1	-	1	-	2	3	3	3
CO3	3	3	3	-	3	-	1	-	1	-	2	3	3	3
CO4	3	3	3	-	3	-	1	-	1	-	2	3	3	3
CO5	3	3	3	-	3	-	1	-	1	-	2	3	3	3

EC20603 **WIRELESS COMMUNICATION** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- acquire knowledge about the design of a cellular system.
- understand the basic concepts of wireless channels.
- acquaint with the basic signal processing techniques.
- be familiar with the multipath mitigation techniques.
- know the different antenna techniques for wireless communication.

UNIT I CELLULAR SYSTEM DESIGN **9**

Evolution of mobile communication system; Cellular concept - Frequency reuse; channel assignment strategies; Handoff-Considerations; Interference and system capacity - Co-channel, adjacent channel, power control; Trunking; grade of service; Coverage and capacity improvement.

UNIT II RADIO PROPAGATION **9**

Path Loss models - Indoor and Outdoor Propagation Models; Free Space Propagation models; Ground Reflection (Two-Ray) model; Link Budget design; Small scale fading; Parameters of mobile multipath channels - Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence time; Fading based on Multipath Time Delay Spread and Doppler Spread.

UNIT III SIGNAL PROCESSING FOR WIRELESS COMMUNICATION **9**

Multiple access techniques - FDMA, TDMA, CDMA, SDMA. Modulation techniques – MSK, GMSK and OFDM; Spread Spectrum Systems - PN sequences, Direct Sequence-Spread Spectrum, Frequency Hopping Spread Spectrum.

UNIT IV MULTIPATH MITIGATION TECHNIQUES **9**

Equalisation - Adaptive equalization, Linear and Non-Linear equalization; Zero forcing and LMS Algorithms; Diversity - Micro and Macro diversity, Diversity combining techniques; Error probability in fading channels with diversity reception, Rake receiver.

UNIT V MULTIPLE ANTENNA TECHNIQUES **9**

MIMO systems - spatial multiplexing, System model, Pre-coding, Beam forming, transmitter diversity, receiver diversity; Channel state information-capacity in fading and non-fading channels.

TOTAL PERIODS **45**

COURSE OUTCOMES

At the end of the course, the students will be able to

- design a cellular system based on resource availability and traffic demands.
- characterize a wireless channel and evolve the system design specifications.
- analyze modulation schemes used in wireless standards
- identify suitable signaling and multipath mitigation techniques for the wireless channel and system under consideration.
- distinguish different MIMO techniques.

TEXT BOOKS

1. Rappaport, T.S., "Wireless communications", Pearson Education, Second Edition, 2010.
2. Andreas.F. Molisch, "Wireless Communications", John Wiley - India, Second Edition, 2011.

REFERENCES

1. Andrea Goldsmith - "Wireless Communication", Cambridge University Press, 2011.
2. Upena Dalal, "Wireless Communication", Oxford University Press, 2014.
3. Van Nee, R. and Ramji Prasad, "OFDM for Wireless Ccommunications", Artech House, 2004.
4. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.

CO PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes:

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CO	Programme Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	-	-	-	-	1	-	2	3	3	3
CO2	3	2	2	1	-	-	-	-	1	-	2	3	3	3
CO3	3	2	2	1	-	-	-	-	2	-	1	3	3	3
CO4	3	2	1	1	-	-	-	-	1	-	1	3	3	3
CO5	3	2	2	1	-	-	-	-	2	-	1	3	3	3

EC20604 **EMBEDDED SYSTEMS LABORATORY** **0 0 4 2**

COURSE OBJECTIVES

To enable the students to

- examine the working of ARM processor
- differentiate the building blocks of Embedded Systems
- interpret the concept of memory map and memory interface
- recognize the characteristics of Real Time Systems and infer the interrupt performance.

LIST OF EXPERIMENTS

1. Flashing of LEDS.
2. Interface Switches and LED's.
3. Interface LCD and Display "Hello World".
4. Interface 4*4 Matrix Keypad.
5. Interfacing seven segments and analysis the Interrupts.
6. Interfacing RTC.
7. Interfacing stepper motor with Arduino UNO.
8. Interfacing DC Motor with Arduino UNO.
9. Interfacing Servo Motor with Arduino UNO.
10. DIY project using sensors with Arduino UNO.

TOTAL PERIODS 60

COURSE OUTCOMES

At the end of the course, the students will be able to

- write programs in ARM for a specific application.
- experiment interface memory and write programs related to memory operations
- analyze the performance of interrupts.
- write programs for interfacing keyboard, display, motor.

CO PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes:

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CO	Programme Outcomes (PO)													
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CO2	3	3	3	3	3	-	-	-	2	-	-	2	3	3
CO3	3	3	3	3	2	-	-	-	3	-	-	2	3	3
CO4	3	3	3	3	3	-	-	-	3	-	-	3	3	3

EC20605 **VLSI LABORATORY** **0 0 4 2**

COURSE OBJECTIVES

To enable the students to

- understand various combinational and sequential circuits
- know the design of combinational and sequential circuits using FPGA
- learn the implementation of real time clock using FPGA
- examine and implement CMOS circuits using Microwind.

LIST OF EXPERIMENTS

1 Design and Simulation of adders and subtractors using Verilog HDL/VHDL.
2 Design and Simulation of ripple carry adder using Verilog HDL/VHDL
3 Design and Simulation of flipflops using Verilog HDL/VHDL
4 Implementation of multiplexer and demultiplexer using Verilog HDL/VHDL.
5 Implementation of synchronous up and down counter circuits using FPGA.
6 Implementation of Real time clock using FPGA.
7 Design and Implementation of encoder and decoder circuits using Schematic entry.
8 Design and Simulation of CMOS inverter using Microwind.
9 Design and Simulation of basic logic gates using Microwind.
10 Study of Pin Assignment, Placement and routing using FPGA.

TOTAL PERIODS 60

COURSE OUTCOMES

At the end of the course, the students will be able to

- design various Combinational and Sequential Circuits.
- analyze pin assignment- placement and routing using FPGA.
- implement Real time clock using FPGA.
- simulate the different CMOS circuits and basic logic gates using Microwind

CO PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes:
(1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak

CO	Programme Outcomes (PO)													
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CO3	2	2	2	2	2	-	-	-	1	-	-	2	3	3
CO4	2	2	2	2	2	-	-	-	1	-	-	2	3	3

EN20601 **CAREER DEVELOPMENT LABORATORY II** **0 0 2 1**

COURSE OBJECTIVES

To enable students to

- draft resume and enhance their skills to manage stress to survive in corporate world.
- excel in interview skills.
- solve the quantitative aptitude problems and improve their problem-solving skills.
- improve their reasoning skills to get placed in reputed companies.

UNIT I RESUME WRITINGS **6**

Resume Writing Skills: Curriculum Vitae and Resume – Things to do while writing a Resume – Mistakes and Pitfalls to Avoid- Cover Letter: General Guidelines – The Content - Stress Management – Dressing Etiquette

Activities: Corporate Resume Building Session I – JAM Session: Level III – Role Play Session (Individual): Level III - Company Profile Analysis Session III – Personality Profile Analysis Session III

UNIT II INTERVIEW SKILLS **6**

Interview Skills: Introduction – Before the Interview – During the Interview – After the Interview – Types of Interview

Activities: Presentation Session: Level II- Group Discussion Session: Level III ,Mock Interview Practice Session, Corporate Resume Building Session II

UNIT III QUANTITATIVE APTITUDE **6**

Permutation and Combination – Probability: Dice, Colours, Coin, Cards ; Partnership – Ages – Calendars

UNIT IV LOGICAL REASONING -I **6**

Making Judgments – Matching Definitions – Cause and Effect

UNIT V LOGICAL REASONING II **6**

Directions – Syllogism – Analogy – Statements and Arguments

TOTAL PERIODS: 30

COURSE OUTCOMES

At the end of the course, the students will be able to

- write resume and enhance their etiquettes.
- demonstrate the interpersonal skills in group discussions.
- compute problems based on quantitative aptitude.
- reveal their logical and verbal reasoning by scoring the expected percentage to get placed in reputed companies.

TEXTBOOKS

1. Agarwal, R.S." a modern approach to Verbal & Non Verbal Reasoning", S.Chand& Co Ltd, New Delhi.2015.
2. Agarwal, R.S. " Objective General English", S.Chand&Co.2016.

REFERENCES

1. Abhijit Guha, "Quantitative Aptitude ", Tata-Mcgraw Hill.2015.
2. Word Power Made Easy By Norman Lewis ,Wr.Goyal Publications.2016.
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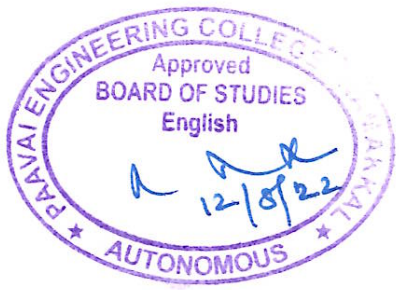
CO3	3	2	2	-	-	1	-	-	-	-	2	-	2	3
CO4	2	3	3	2	1	3	3	1	-	1	2	-	2	3



EC20151 **MEDICAL ELECTRONICS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- gain knowledge about the various electro-physiological parameters, it's methods of recording and also transmitting.
- understand the different bio-chemical and non-electrical parameters.
- learn about the various assist devices used in the hospitals.
- be familiar with the equipments used for physical medicine and biotelemetry
- know about recent trends in medical instrumentation.

UNIT I ELECTRO-PHYSIOLOGY AND BIOPOTENTIAL RECORDING 9

Origin of Bio-potentials, biopotential electrodes; bioamplifiers; ECG, EEG, EMG, PCG, lead systems and recording methods, typical waveforms, signal characteristics.

UNIT II BIO-CHEMICAL AND NON-ELECTRICAL PARAMETER MEASUREMENT 9

pH, PO2, PCO2, Colorimeter; Auto analyzer, Blood flow meter; cardiac output respiratory measurement; Blood pressure, temperature, pulse rate; Blood cell counters.

UNIT III ASSIST DEVICES 9

Cardiac pacemakers - Need, different types; Ventilators; DC defibrillators - asynchronous and synchronous; Hemodialyser - Membrane, Dialysate; Heart lung machine - Block diagram, oxygenators and pumps.

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY 9

Diathermies - Shortwave, ultrasonic, microwave type, applications, Surgical Diathermy; Telemetry principles, frequency selection, biotelemetry, radiopill; electrical safety.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Thermography - principle, detectors; Endoscopy unit; Applications of Laser in medicine, cryogenic application, Introduction to telemedicine.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- analyze the various biosignals and vital parameters.
- explain the function and application of various diagnostic equipments.
- illustrate the working of various assist devices.

- work with the equipments used for physical medicine.
- explain the recent developments in the field of medical engineering.

TEXT BOOKS

1. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, "Biomedical Instrumentation and Measurements", Pearson Education India, 2nd Edition, 2015.
2. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and Sons, New York, 4th Edition, 2009.

REFERENCE BOOKS

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 3rd Edition, 2014.
2. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 4th Edition, 2014.
3. John Denis Enderle, Joseph D. Bronzino, Susan M. Blanchard, Introduction toBiomedical Engineering: 'Academic Press, 3rd Edition 2012.
4. C.Raja Rao, Sk Guha, "Principles of Medical Electronics and Biomedical Instumentation", University Press, 2000.

CO/PO MAPPING

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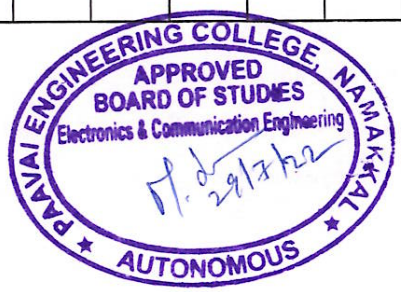
CO2	3	3	3	3	-	2	1	1	-	-	-	-	3	3
CO3	3	3	3	3	-	2	1	1	-	-	-	-	3	3
CO4	3	3	3	3	-	2	1	1	-	-	-	-	3	3
CO5	3	3	3	3	-	2	1	1	-	-	-	-	3	3



EC20152 **WIRELESS SYSTEM AND STANDARDS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- know the concepts of TDMA, GSM, CDMA in 2G and 3G UMTS in wireless cellular networks
- understand the wireless system operstions and standards
- gain knowledge about various wireless application protocols
- be familiar with the different wireless network standards
- possess knowledge on Personal Area Network

UNIT I SECOND AND THIRD GENERATION: ARCHITECTURE AND PROCESS FLOW **9**

Second Generation TDMA - GSM Architecture, Air Interface, Channels, Voice-call setup, Handover, EDGE architecture; Second Generation CDMA - Forward and Reverse channel, Call Handoff; Third Generation systems - UMTS network architecture.

UNIT II WIRELESS SYSTEM OPERATIONS AND STANDARDS **9**

Cordless systems - Time Division Duplex, DECT Operation, ADPCM; Wireless Local Loop - Propagation considerations for WLL OFDM, IEEE 802.16; Long-Term Evolution-System Architecture, Transmission Techniques, Channels in the radio interface, Radio Resource Management.

UNIT III WIRELESS APPLICATION PROTOCOLS **9**

Wireless Application Protocol - Programming Model, Architectural Overview, Wireless Markup Language, WML Script, Wireless Application Environment, Wireless Session Protocol, Wireless Transaction Protocol, Wireless Datagram Protocol.

UNIT IV WIRELESS LANS **9**

Spread Spectrum LANs - Configuration, Transmission issues; Narrowband Microwave LANs - Licensed Narrow Band RF, Unlicensed narrowband RF; IEEE 802.11- Architecture and services; IEEE 802.11a/b/n standards; Infrared LANs - Strengths and Weakness, Transmission techniques.

UNIT V WIRELESS PAN **9**

IEEE 802.15.1 - Protocol stack, Link types, security, network connection establishment; IEEE 802.15 WPAN standards - network model; Zigbee- Device Architecture, Topologies, applications; IEEE 802.15.3a- Ultra-wide-Band Radio Communication.

TOTAL PERIODS 45

OUTCOMES

At the end of the course, the students will be able to

- outline the concepts of TDMA, GSM, CDMA in the second-generation wireless cellular networks.
- describe the working principles of various wireless standards and its operations

- explain the various wireless application protocols
- analyse the various types wireless LANs and summarize the Wireless LAN Standards
- enumerate the features and operations of various Wireless Personal Area Networks and its standards

TEXT BOOKS

1. Clint Smith, P.E. and Daniel Collins, "3G Wireless Networks", Tata McGraw Hill, 2nd Edition, 2017.
2. Kaveh Pahlavan and Prashant Krishnamurthy, "Principles of Wireless networks - A unified Approach", Prentice Hall, 2013.

REFERENCE BOOKS

1. William Stallings, "Wireless Communications and Networks", Prentice Hall, 2nd Edition 2009.
2. Dharma Prakash Agarwal and Qing-An Zeng, "Introduction to Wireless and Mobile Systems", Thomson India, 3rd Edition, 2011.
3. Vijay. K. Garg, "Wireless Communication and Networking", Morgan Kauffmann Publishers, 2007.
4. Mischa Schwartz, "Mobile Wireless Communications", Cambridge University Press, 2005.

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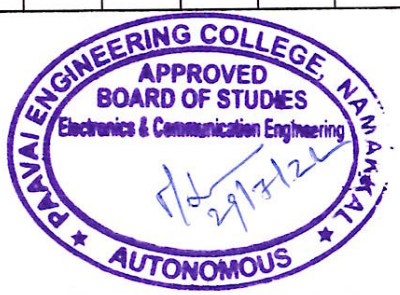
CO3	3	3	3	3	2	-	1	-	-	-	-	3	3	3
CO4	3	3	3	3	2	-	1	-	-	-	-	3	3	3
CO5	3	3	3	3	2	-	1	-	-	-	-	3	3	3



EC20153 DIGITAL SWITCHING AND TRANSMISSION 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- gain knowledge about the different types of signaling in digital telephony.
- learn the technology involved in space switching, time switching and combination switching.
- get exposed to the complete fundamentals and essential features in the statistical modeling of telephone traffic.
- know about the evolution of switching systems and the synchronization.
- understand the basics of telecommunication networks and digital transmission of data.

UNIT I EVOLUTION AND BUILDING BLOCKS OF SWITCHING SYSTEMS 9

Message switching and Circuit switching - Building blocks of a digital switching system, functions of switching systems - Distribution systems ; Digital Switching Systems - Switching system hierarchy - Evolution of digital switching systems - Stored program control switching system; Basic Call processing - Call signaling - SS7 signalling, Basics of crossbar systems.

UNIT II DIGITAL SWITCHING TECHNOLOGIES 9

Introduction - Single stage networks, Gradings, Link Systems, GOS of Linked systems; Space Division switching; Folded switches; Digital Time Division switching; Combinational Two dimensional switching; SpaceTime and Time-Space switching; Three dimensional - Space-Time-Space and Time Space Time switching ; Digital Cross Connect Systems - DCS hierarchy.

UNIT III TELECOMMUNICATION TRAFFIC 9

Unit of traffic – congestion, traffic parameters, Mathematical model, lost call systems, Queuing systems- Busy Hours Call Attempt , Traffic Intensity , Call processing capacity ; Call Completion Ratio - Call Blocking Probability, Grade of Service , Erlang B-Formula , Delay Systems ,Service Times - Erlang C Formula.

UNIT IV NETWORK SYNCHRONISATION 9

Timing recovery-congestion-clock instability, jitter slips; asynchronous multiplexing-space and time switching; time switching networks; synchronization- hierarchical synchronization; switching system software-basic software architecture, software architecture for level 1-3 control.

UNIT V TRANSMISSION SYSTEMS 9

Network Structure - services, regulations, standards; Digital Transmission - PDH, SDH - SDH Features- Network evolution - Cross connect - Add-Drop Mux - SDH Frame structure; Analog Local Loop; ISDN local loop; DSL,ADSL; Wireless Local Loop; Fiber in the loop; Mobile,Satellite Phone local loop.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- explain the electromechanical switching systems and its comparison with the digital switching.
- define the technologies associated with the data switching operations

- analyze and determine traffic parameters related to call connect and grade of service.
- describe the operating principles of network synchronization and clock recovery.
- design transmission and switching systems to meet out the required blocking probability.

TEXT BOOKS

1. J.C. Bellamy, "Digital Telephony", Third Edition, Wiley, 2006.
2. J.E. Flood, "Telecommunication Switching, Traffic and Networks", Pearson, 2007.

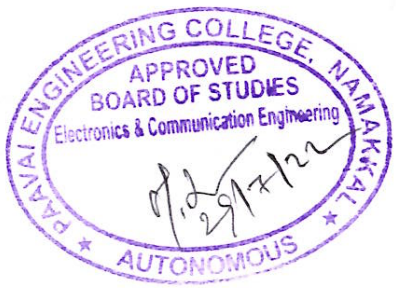
REFERENCES

1. Thiagarajan Viswanathan, "Telecommunication Switching Systems and Networks", Prentice Hall India, 2015.
2. Viswanathan, "Telecommunication Switching Systems and Networks", Prentice Hall India, 2006.
3. Wayne Tomasi "Advanced electronic communications systems", Prentice Hall India, 2014.
4. E. Keiser & E. Strange, "Digital Telephony and Network Integration", Second Edition, Van Nostrand, 1995.

CO/PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes:
(1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak

CO	Programme Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	3	-	-	-	-	-	2	3	3	2
CO2	3	3	3	-	3	-	-	-	-	-	1	3	3	2
CO3	3	3	3	1	3	-	-	-	-	-	2	3	3	2
CO4	3	3	3	-	3	-	-	-	-	-	1	3	3	2
CO5	3	3	3	1	2	-	-	-	-	-	3	3	3	2



EC20154 COMPUTER ARCHITECTURE AND ORGANISATION 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- know the basic structure and operation of a digital computer
- learn the arithmetic and logic unit and implementation of processing unit.
- gain knowledge about the concepts of pipelining.
- understand the hierarchical memory system including cache and virtual memories.
- make different ways of communication with I/O devices.

UNIT I STRUCTURE OF COMPUTERS 9

Functional Units; Basic Operational Concepts; Performance; Instruction Set Architecture - Instructions and Instruction Sequencing - Addressing Modes; RISC and CISC; Fixed Point and Floating-Point Operations.

UNIT II PROCESSING UNIT 9

Fundamental Concepts; Instruction Execution; Hardware Components; Instruction Fetch and Execution Steps; Hardwired Control - Micro Programmed Control; Nano Programming.

UNIT III PIPELINING 9

Basic Concepts; Pipeline Organization - Pipelining Issues; Data Dependencies; Memory Delays - Branch Delays; Resource Limitations; Performance Evaluation; Superscalar Operation.

UNIT IV MEMORY SYSTEM 9

Basic Concepts; Semiconductor RAM Memories - Read Only Memories, Memory Hierarchy, Cache Memories; Performance Considerations; Virtual Memory - Memory Management Requirements- Secondary Storage Devices.

UNIT V I/O ORGANIZATION 9

Accessing I/O Devices - Programmed I/O - Interrupt Initiated I/O; Direct Memory Access; Buses - Bus Arbitration; Interconnection Standards - SCSI, USB, SATA - I/O Devices and Processors.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- explain the instruction sets with various addressing modes.
- outline the execution of instructions and working of hardwired control, micro programmed control.
- summarize pipelining concepts and superscalar operation.
- evaluate the performance of memory in commercial processor
- analyze the organization of I/O devices.

TEXT BOOKS

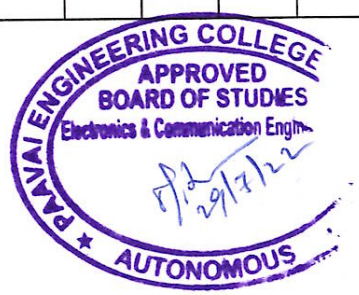
1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software interface", 5th Edition, Elsevier, 2014.
2. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill,2012

REFERENCES

1. M. Morris Mano, "Computer System Architecture", 3rd Edition, McGraw Hill Reprint, 2012.
2. William Stallings, "Computer Organization and Architecture - Designing for Performance", 8th Edition, Prentice Hall, 2010
3. John L. Hennessey and David A. Patterson, "Computer Architecture - A Quantitative Approach" Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.
4. D.A. Patterson y J.L.Hennessy, "Computer Organization and Design: The Hardware/Software Interface."Morgan Kaufmann. 4th Edition, 2009.

CO/PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes: (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak														
CO	**Programme Outcomes (PO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	1	-	2	2	-	-	3	-	2	3	3	3
CO2	3	2	-	1	2	-	-	-	-	-	2	3	3	3
CO3	3	-	1	-	2	-	-	-	-	-	2	3	3	3
CO4	2	-	-	2	2	-	-	-	-	-	2	2	2	3
CO5	3	-	-	-	2	3	-	-	2	-	2	3	3	3



EC20251 **SPEECH PROCESSING** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- introduce speech production and related parameters of speech.
- show the computation techniques for speech analysis.
- understand different speech modeling procedures.
- know the various speech recognition methods and its applications.
- gain knowledge about the speech synthesis methods.

UNIT I SPEECH CONCEPTS **9**

Articulatory Phonetics - Production and Classification of Speech Sounds; Acoustic Phonetics - acoustics of speech production; Review of Digital Signal Processing concepts - Short-Time Fourier Transform, Filter-Bank, LPC Methods.

UNIT II SPEECH ANALYSIS **9**

Speech Analysis - Speech analysis methods, the bank of filters, Linear predictive coding for speech recognition; Pattern comparison techniques - Speech distortion measures, mathematical and perceptual, Log spectral distance, Cepstral distances, Weighted cepstral distances, Likelihood distortions, Spectral distortion using a warped frequency scale; Feature extraction - PLP and MFCC coefficients.

UNIT III SPEECH MODELING **9**

Hidden Markov Models - Markov Processes, HMMs-Evaluation, Optimal State Sequence, Viterbi Search, Baum - Welch Parameter Re-estimation, Implementation issues.

UNIT IV SPEECH RECOGNITION **9**

Large Vocabulary Continuous Speech Recognition - Architecture of a large vocabulary continuous speech recognition system, acoustics and language models, n-grams, context dependent sub-word units; Applications and present status.

UNIT V SPEECH SYNTHESIS **9**

Text-to-Speech Synthesis - Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness; Applications and present status.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- model speech production system and describe the fundamentals of speech.
- extract and compare different speech parameters.
- choose an appropriate statistical speech model for a given application.
- design a speech recognition system.
- use different speech synthesis techniques.

TEXT BOOKS

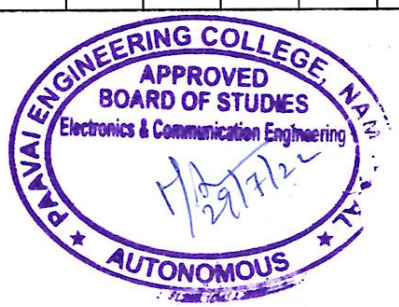
1. Lawrence Rabiner and Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education, 2009.
2. Daniel Jurafsky and James H Martin, "Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education, 2009.

REFERENCES

1. Steven W. Smith, "The Scientist and Engineer"s Guide to Digital Signal Processing", California Technical Publishing, 1999.
2. Thomas F Quatieri, "Discrete-Time Speech Signal Processing - Principles and Practice", Pearson Education, 2004.
3. Claudio Becchetti and Lucio Prina Ricotti, "Speech Recognition", John Wiley and Sons, 1999.
4. Frederick Jelinek, "Statistical Methods of Speech Recognition", MIT Press, 1998.

CO/PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes: (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak														
CO	**Programme Outcomes (PO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	1	1	-	-	-	-	-	2	2	3	2
CO2	3	3	3	2	2	-	-	-	-	-	2	2	3	2
CO3	3	3	3	2	2	-	-	-	-	-	2	2	3	2
CO4	3	3	3	2	2	-	-	-	-	-	2	2	3	2
CO5	3	3	3	2	2	-	-	-	-	-	2	2	3	2



EC20252 **WIRELESS NETWORKS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- understand the concepts of Network planning
- know the wireless network operations
- be familiar with the fundamentals of Wireless WANs
- have in depth knowledge about different broadband networks
- acquire knowledge about wireless geolocation systems

UNIT I NETWORK PLANNING **9**

Medium access alternatives - Fixed assignment for voice oriented networks, random access for data oriented networks; Network Planning - Wireless Network Topologies, Cellular Topologies, Signal to Interference Ratio Calculation, Capacity Expansion Techniques.

UNIT II WIRELESS NETWORK OPERATIONS **9**

Mobility Management - Location Management, Handoff Management, Mobile IP; Radio Resource Power Management - Power Control, Energy Efficient Designs; Security requirements for wireless networks.

UNIT III WIRELESS WANS **9**

GSM - Services, Architecture; CDMA - IS-95 Forward Channel, Reverse Channel, Frame format; IMT2000; Mobile Data - classification; Cellular Digital Packet Data - Reference Architecture, Mobility Support, Protocol Layers.

UNIT IV BROADBAND NETWORKS **9**

IEEE802.11 WLANs - Reference architecture, Layered Protocol architecture, Physical Layer, MAC layer, MAC Management Sublayer; Wireless ATM; HIPERLAN -1; HIPERLAN -2.

UNIT V WIRELESS GEOLOCATION SYSTEMS **9**

Wireless Geolocation - Architecture; Technologies - Direction-Based and Distance Based Techniques; Geolocation Standards E-911- architecture, services; Performance measures.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- apply the concepts of Network planning in various applications
- analyze the wireless network operations
- elucidate about Wireless WAN standards
- compare the different broadband networks
- utilise the knowledge about wireless geolocation systems

TEXT BOOKS

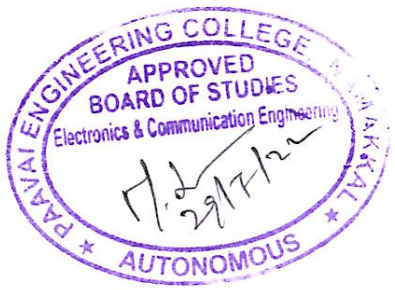
1. Kaveh Pahlavan, "Principles of Wireless Networks" Second Edition, Prentice Hall India 2012.
2. Vijay Garg,"Wireless Communications and networking", First Edition, Elsevier 2009.

REFERENCES

1. P. Nicopolitidis , M. S. Obaidat , G. I. Papadimitriou , A. S. Pomportsis "Wireless Networks",Wiley, 2009.
2. Anurag Kumar, D.Manjunath, Joy kuri, "Wireless Networking", First Edition, Elsevier 2011.
3. Simon Haykin, Michael Moher, David Koilpillai, "Modern Wireless Communications", First Edition, Pearson Education 2013.
4. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", Second Edition, Academic Press, 2008.

CO/PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak														
CO	**Programme Outcomes (PO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	3	1	-	-	-	-	1	-	2	3	3	3
CO2	3	2	2	1	-	-	-	-	1	-	2	3	3	3
CO3	3	2	2	1	-	-	-	-		-	2	3	3	3
CO4	3	2	1	2	-	-	-	-	2	-	2	3	3	3
CO5	3	2	2	2	-	-	-	-	2	-	2	3	3	3



EC20253 **DISPLAY TECHNOLOGIES** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- know the fundamentals of eye
- acquire knowledge of various LCD technologies
- understand the working of LED displays
- determine the relation between the various 3-D technologies
- illustrate the operation of micro displays

UNIT I EYE CHARACTERISTICS **9**

Properties of Light, Geometric Optics, Optical Modulation; Vision and Perception - Anatomy of Eye, Light Detection and Sensitivity, Spatial Vision and Pattern Perception, Passive Matrix, Active Matrix Driving.

UNIT II LIQUID CRYSTAL DISPLAY **9**

Display Glasses, Inorganic Semiconductor TFT Technology, Organic TFT Technology; Transparent Conductors, Liquid Crystal Displays - Properties of Liquid Crystals, LCD Device Technology; Twisted Numeric and Super twisted Numeric Displays

UNIT III ADVANCED LED DISPLAYS **9**

Cathode Ray Tubes, Displays - Vacuum Florescent Displays, Filed Emission Displays; Plasma Display Panels, LED Display Panels; OLEDs, Active Matrix for OLED Displays.

UNIT IV 3-D TECHNOLOGY **9**

3-D Displays; 3-D Cinema Technology, Auto stereoscopic 3-D Technology, Volumetric and 3-D Volumetric Display Technology, Holographic 3-D Technology; Mobile Displays - Trans reflective Displays for Mobile Devices, Liquid Crystal Optics for Mobile Displays, Energy Aspects of Mobile Display Technology

UNIT V MICRO DISPLAYS **9**

DLP Projection Technology; Micro-display Applications-Projection Systems, Head Worn Displays; Electronic View Finders, Cognitive Engineering and Information Displays; Display Metrology, Green Technologies in Display Engineering.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- determine the charactertics of eye.
- analyze the function of LCD display.
- enumerate the operation of LED displays.
- explain the various operation of 3-D displays.
- determine the various operation on micro displays.

TEXT BOOKS

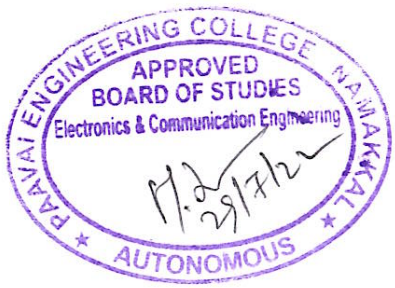
1. Janglin Chen,Wayne Cranton,Mark Fihn," Handbook of Visual Display technology",Springer Publication,2012.
2. Shoichi Matsumoto, "Electronic Display Devices" , Wiley, 1990 - Technology & Engineering.

REFERENCES

1. Jacques I. Pankove, D.J. Channin, "Display Devices",Springer Berlin Heidelberg, 2014.
2. Joseph Castellano , "Handbook of Display Technology" First Edition , 2012.
3. R.R.Gulati, "Monochrome & Color Television," New Age International Publisher, 2003.
4. A.M.Dhake, "TV and Video Engineering", Tata McGraw-Hill Education, 1999.

CO/PO MAPPING

Mapping of Course Outcomes with Programme Outcomes (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak														
CO	**Programme Outcomes (PO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	2	2	-	-	-	-	-	-	2	3	3
CO2	3	3	3	2	2	-	-	-	-	-	-	2	3	3
CO3	3	3	3	-	2	-	-	-	-	-	-	2	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	2	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	3	3	3



IT20255 **OBJECT ORIENTED PROGRAMMING** 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand Object Oriented Programming concepts.
- study the concept of constructor and operator overloading.
- compile of basic concepts of inheritance and the utilization.
- know the concepts of Java using Packages and Arrays.
- use of Interface and I/O streams.

UNIT I INTRODUCTION 9

Object-Oriented Paradigm - Elements of Object Oriented Programming, Merits and Demerits of OO Methodology; C++ fundamentals - Classes and Objects, Function, Function overloading, Static data and member functions, inline function.

UNIT II CONSTRUCTOR AND OPERATOR OVERLOADING 9

Constructor - Copy Constructors, and Default Arguments; Array of Objects - Pointer to Object member; Friend Function; Operator Overloading - binary and Unary operator overloading.

UNIT III TEMPLATE AND INHERITENCE 9

Templates - Function Template, Class Template; Inheritance - Derived class, Abstract class, Types of Inheritance; Virtual Functions; Exception Handling.

UNIT IV INTRODUCTION TO JAVA 9

Introduction to JAVA - bytecode, virtual machines, objects, classes, Javadoc, packages, Arrays, Strings.

UNIT V INHERITANCE, THREADING AND I/O 9

Inheritance; interfaces and inner classes; exception handling; threads; Streams and I/O.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end this course, students will be able to

- understand the principles of Object Oriented Programming.
- create a program using Constructor.
- re-write solutions to a given problems using inheritance and polymorphism concepts.
- develop simple Java program using class, methods and objects.
- perform the concepts of concurrent programming.

TEXT BOOKS

1. Herbert Schildt "C++: The Complete Reference", Tata McGraw Hill, 4th Edition, 2003.
2. Herbert Schildt, "JAVA, The Complete Reference" Tata Mcgraw Hill, 8th edition, 2011.

REFERENCES

1. Bjarne Stroustrup, "The C++ Programming Language", Addison Wesley, 2014.
2. K.R. Venugopal, Rajkumar Buyya, T.Ravishankar, "Mastering C++", TMH, 2009.
3. Bruce Eckel, "Thinking in JAVA", Prentice Hall,2006 6. Kathy Sierra, Bert Bates," Head First JAVA",O"Rielly,2005.
4. Kathy Sierra, Bert Bates," Head First JAVA",O"Rielly,2005.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak													
COs	Programme Outcomes(POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	-	-	-	-	-	2	1	2	2
CO2	3	2	2	1	-	-	-	-	1	1	2	1	2	2
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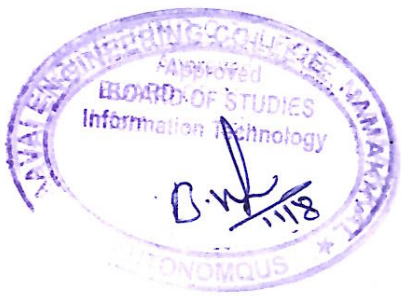

EC20351 DIGITAL IMAGE PROCESSING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand digital image fundamentals.
- infer simple image processing techniques.
- illustrate the image restoration and segmentation techniques.
- know the concept of image compression and morphological operations
- learn image representation and object recognition.

UNIT I DIGITAL IMAGE CONCEPTS 9

Fundamental Steps in Digital Image Processing, Components, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Relationships between pixels, Colour models.

UNIT II IMAGE ENHANCEMENT 9

Intensity Transformation - Basic intensity transformations, Histogram processing, Fundamentals of spatial filtering, Smoothing and sharpening spatial filters; Frequency domain filtering - Image smoothing and sharpening using frequency domain filters - Ideal, Butterworth and Gaussian Filters .

UNIT III IMAGE RESTORATION AND SEGMENTATION 9

Model of image restoration process, Noise models, Restoration in the presence of noise only - Spatial filtering, Periodic noise reduction by frequency domain filtering, Inverse filtering, Minimum mean square error - Wiener filtering; segmentation - point, Line, Edge Detection, Thresholding, Region -Based Segmentation, Segmentation using morphological watersheds.

UNIT IV IMAGE COMPRESSION AND MORPHOLOGICAL OPERATIONS 9

Image compression - Fundamentals of redundancies; basic compression methods - Huffman coding, Arithmetic coding, LZW coding, JPEG compression standard. Morphological image processing - erosion and dilation, opening and closing; Basic morphological algorithms - Boundary extraction, hole filling, connected components, thinning, thickening, skeletons.

UNIT V IMAGE REPRESENTATION AND OBJECT RECOGNITION 9

Representation, boundary descriptors, regional descriptors, relational descriptors; object recognition, patterns and pattern classes; recognition based on decision -Theoretic methods.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- apply the digital image fundamentals on images.
- operate on images using the simple image processing techniques.
- work on images using image restoration and segmentation techniques.
- explain the concepts of image compression and morphological operations
- represent image in the form of features.

TEXT BOOKS

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", 3rd Edition, Tata Mc Graw Hill Pvt. Ltd., 2020.
2. Anil Jain K. "Fundamentals of Digital Image Processing", Prentice Hall India, 2011.

REFERENCES

1. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, Prentice Hall India, Learning Pvt. Ltd., 2011.
2. Milan Sonka, Vaclav Hlavav, Roger Boyle, "Image Processing, Analysis and Machine Vision", 2nd Edition, Thomson Learning, 2001.
3. Willliam K Pratt, "Digital Image Processing", 3rd Edition, John Wiley & Sons, 2007.
4. Rangaraj M. Rangayyan, "Biomedical Image Analysis", 2nd Edition, CRC Press, 2005.

CO/PO MAPPING

Mapping of Course Outcomes with Programme Outcomes (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak														
CO	**Programme Outcomes (PO)**													
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CO3	3	3	3	-	3	-	-	-	-	-	-	3	3	3
CO4	3	3	3	-	3	-	-	-	-	-	-	3	3	3
CO5	3	3	3	-	3	-	-	-	-	-	-	3	3	3

EC20352 **NETWORK SECURITY** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- know the concepts of securing computer network protocols.
- understand the concepts of cryptography techniques.
- gain knowledge about hash function.
- be familiar with the authentication principles.
- be exposed with various security control and firewalls.

UNIT I CRYPTOGRAPHY **9**

Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, digital signatures; Key Management and Distribution - Symmetric Key Distribution, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure.

UNIT II SECRET KEY CRYPTOGRAPHY **9**

Block Encryption, DES rounds, S-Boxes IDEA- Overview, comparison with DES, Key expansion, IDEA rounds, Uses of Secret key Cryptography; ECB, CBC, OFB, CFB, Multiple encryptions DES.

UNIT III FUNCTIONS AND MESSAGE DIGESTS **9**

Length of hash, uses, algorithms - MD2, MD4, MD5, SHS; MD2 - Algorithm, Padding, checksum, passes; MD4 and 5 - Algorithm, padding, stages, digest computation; SHS: Overview, padding, stages.

UNIT IV AUTHENTICATION **9**

User Authentication - Remote User - Authentication Principles, Remote User-Authentication Using Symmetric Encryption, Kerberos Systems, Remote User Authentication Using Asymmetric Encryption. Malicious Software - Viruses, Worms, System Corruption, Attack Agents, Information Theft Keyloggers, Phishing, Spyware Payload Stealthing, Backdoors, Rootkits, Distributed Denial of Service Attacks.

UNIT V SECURITY CONTROL **9**

Network Access Control - Network Access Control, Extensible Authentication Protocol, IEEE 802.1X Port-Based Network Access Control; IP Security- IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange (IKE); Wireless Network Security - Mobile Device Security, Wireless LAN Security; Firewalls and Intrusion Detection Systems; Concepts - Blockchains, Cloud Security and IoT security.

TOTAL PERIODS **45**

COURSE OUTCOMES

At the end of the course, the student will be able to

- identify suitable cryptography method for particular application.
- enumerate the various secret key cryptographic techniques.
- explain about the hash function in cryptography.

- utilise various authentication measures in cryptography.
- work on different security control aspects.

TEXT BOOKS

1. William Stallings, "Cryptography and Network Security": Principles and Practice, 6th Edition, Pearson, 2017.
2. M. Speciner, R. Perlman, C. "Network Security: Private Communications in a Public World", Kaufman, Prentice Hall, 2017.

REFERENCES

1. Atul Kahate, "Cryptography and Network Security", McGraw Hill, 2017.
2. Stallings, W,"Cryptography and Network Security: Principles and Practice", 3rd Edition, Prentice Hall, 2003.
3. J. Michael Stewart, "Network Security, Firewalls and VPNs", Jones & Bartlett Learning, 2013.
4. Michael Gregg, "The Network Security Test Lab: A Step-By-Step Guide", Dreamtech Press, 2015.

CO/PO MAPPING

Mapping of Course Outcomes with Programme Outcomes (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak													
CO	Programme Outcomes (PO)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	2	2	2	1	-	-	2	3	3
CO2	3	3	3	3	-	2	1	1	1	-	-	2	3	3
CO3	3	3	3	-	-	2	2	2	1	-	-	2	3	3
CO4	3	3	3	3	-	2	1	1	1	-	-	2	3	3
CO5	3	3	3	-	-	2	2	2	1	-	-	2	3	3

EC20353 **NANOELECTRONICS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- understand the basic concepts for nanostructured materials.
- explore the basics of nanomaterial synthesis and characterization.
- be familiar with the measurement concepts of nanoelectronic materials
- know the basics of nanostructures.
- acquire knowledge about different applications of nanostructures.

UNIT I NANOSTRUCTURED MATERIALS **9**

importance of Nanotechnology; history of Nanotechnology; opportunity at the nanoscale length and time scale in structures; basic structure of Nanoparticles; kinetics in Nanostructured materials - zero dimensional, size and shape of nanoparticles; one-dimensional and two-dimensional nanostructures.

UNIT II FABRICATION AND CHARACTERIZATION OF NANOMATERIALS **9**

Types of Nanomaterials - Quantum dots, Nanoparticles, Nanocrystals, Dendrimers, Buckyballs, Nanotubes; Gas, liquid, and solid - phase synthesis of nanomaterials; Lithography techniques -Photolithography, Dip-pen, Electron beam lithography; Nanoparticles, nanoclusters, nanotubes, nanowires and nanodots; Semiconductor nanocrystals.

UNIT III MEASUREMENT OF NANOMATERIALS **9**

Electronic and optoelectronic properties of molecular materials - absorption, fluorescence, resonance; methods for the measurement of nanomaterials; microscopy measurements - SEM, TEM, AFM, STM; Confocal and TIRF imaging.

UNIT IV NANOSTRUCTURES **9**

Carbon Nanotubes, fullerenes, Nanowires, Quantum Dots; applications of nanostructures; reinforcement in ceramics, drug delivery, giant magneto resistance; cells response to Nanostructures.

UNIT V APPLICATIONS OF NANOSTRUCTURES **9**

Nanoelectronic architectures and computations, Nanosensors, Nanotechnology in diagnostics applications, environmental and agricultural applications of nanotechnology; Nanotechnology for energy systems.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- describe the basic science behind the properties of materials.
- interpret the creation, characterization, and manipulation of nanoscale materials.
- comprehend the applications of nanotechnology at the leading edge of scientific research.
- identify the different nano structure materials.
- apply their knowledge of nanotechnology for new applications.

TEXT BOOKS

1. Robert Puers, Livio Baldi, "Nano electronics:Materials, Devices and Applications",Wiley-2017.
2. Bharat Bhushan, "Springer Handbook of Nanotechnology", 2004

REFERENCES

1. Carl.C Koch, "Nanostructured Materials: Processing, Properties and Potential Applications", William Andrew Publishing Norwich, 2006.
2. Michael Ashby, Paulo Ferreira, Daniel L. Schodek, Butterworth-Heinemann "Nanomaterials, Nanotechnologies and Design: an Introduction to Engineers and Architects", 2009.
3. Z.L. Wang, Y. Liu, Z. Zhang "Handbook of Nanophase and Nanostructured Materials", Kluwer Academic/Plenum Publishers, 2003.
4. Tseung-Yuen Tseng and Hari Singh Nalwa, "Handbook of Nanoceramics and their Based Nanodevices" American Scientific Publishers, 2003.

CO/PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak														
CO	**Programme Outcomes (PO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	2	-	-	-	-	-	-	-	3	3
CO2	3	3	3	2	3	-	-	-	-	-	-	-	3	3
CO3	3	3	3	-	2	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	2	-	-	-	-	-	-	-	3	3
CO5	3	3	3	-	2	-	-	-	-	-	-	-	3	3

IT20355	ARTIFICIAL INTELLIGENCE	3	0	0	3

COURSE OBJECTIVES

To enable the students to

- acquire a knowledge of various methods of different problem solving and searching.
- understand the concepts of knowledge representation.
- understand about inference and how to solve the problems using various inference technique.
- realize the concepts of planning and learning.
- design various AI systems.

UNIT I INTRODUCTION 9

Introduction to AI - Problem formulation, Problem Definition; Production systems - Control strategies, Search strategies, Problem characteristics, Production system characteristics, Specialized productions system; Problem solving methods; Problem graphs; Matching; Indexing and Heuristic functions; Hill Climbing; Depth first and Breath first; Constraints satisfaction; Related algorithms; Measure of performance and analysis of search algorithms.

UNIT II REPRESENTATION OF KNOWLEDGE 9

Game playing; Knowledge representation - Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus; Knowledge representation using other - Structured representation of knowledge.

UNIT III KNOWLEDGE INFERENCE 9

Knowledge representation; Production based system; Frame based system. Inference - Backward logic chaining, Forward chaining; Rule value approach; Fuzzy reasoning.

UNIT IV PLANNING AND EXPERT SYSTEM 9

Basic plan generation systems - Strips, Advanced plan generation systems, K strips; Strategic explanations - Why, Why not and how explanations; Expert systems - Architecture of expert systems, Roles of expert systems, Knowledge Acquisition; Typical expert systems Applications - MYCIN, DART, XOON.

UNIT V AI APPLICATIONS 9

AI Applications - Language Models, Information Retrieval, Information Extraction, Natural Language Processing, Machine Translation, Speech Recognition; Robot - Hardware, Perception, Planning, Moving.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- demonstrate awareness of intelligent agents and problem solving using uninformed, informed and local search methods.
- develop knowledge about usage of propositional logic and first order logic for making inferences.
- use the knowledge and the process of inference to derive new facts.
- describe the use of planning and explain about various expert systems.
- design and develop various AI systems.

TEXT BOOKS

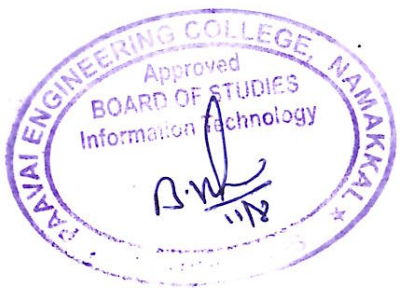
1. Kevin Night and Elaine Rich, Nair B, "Artificial Intelligence", 3rd edition, McGraw Hill- 2017.
2. Stuart Russel and Peter Norvig, "AI -A Modern Approach", 3rd Edition, Pearson Education 2015.

REFERENCES

1. Lavika Goel "Artificial Intelligence Concepts and Applications", Wiley 2021.
2. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2015.
3. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education 2013.

CO-PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3-Strong,2-Medium,1-Weak														
COs	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	-	-	-	-	-	-	1	3	2
CO2	3	3	3	3	2	-	-	-	-	-	-	1	3	2
CO3	3	3	3	3	2	-	-	-	-	-	-	1	3	2
CO4	3	3	3	3	2	-	-	-	-	-	-	1	3	2
CO5	3	3	3	3	2	2	-	-	-	-	-	1	3	3



EC20901 **CONSUMER ELECTRONICS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- acquire knowledge about various electronic devices.
- understand the concepts of electronic display systems.
- know the various applications of smart home.
- be familiar with the working principles of various home appliances.
- have knowledge about the basic communication system devices.

UNIT I INTRODUCTION **9**

History of Electronic Devices - Vacuum Tubes, Transistors, Integrated Circuits Moorse Law, Semiconductor Devices, Diodes, Rectifiers, Transistors, Logic Gates, Combinational Circuits, ADC, DAC and Microprocessors, Microprocessor Vs Microcontrollers, Microcontrollers in consumer electronics, Energy management, Intelligent Building Perspective.

UNIT II ENTERTAINMENT ELECTRONICS **9**

Audio systems - Construction and working principle of Microphone, Loud speaker, AM and FM receiver, stereo, 2.1 home theatre, 5.1 home theatre; Display systems - CRT, LCD, LED and Graphics displays; Video Players - DVD and Blue RAY; Recording Systems - Digital Cameras and Camcorders.

UNIT III SMART HOME **9**

Technology involved in Smart home, Home Virtual Assistants - Alexa and Google Home; Home Security Systems - Intruder Detection, Automated blinds, Motion Sensors, Thermal Sensors and Image Sensors, PIR, IR, Water Level Sensors.

UNIT IV HOME APPLIANCES **9**

Home Enablement Systems - RFID Home, Lighting control, Automatic Cleaning Robots, Washing Machines; Kitchen Electronics - Microwave, Dishwasher, Induction Stoves, Smart Refrigerators, Smart alarms, Smart toilet, Smart floor, Smart locks.

UNIT V COMMUNICATION SYSTEMS **9**

Cordless Telephones, Fax Machines, PDAs - Tablets, Smart Phones and Smart Watches; Introduction to Smart OS - Android and iOS; Video Conferencing Systems - Web/IP Camera, Videosecurity, Internet Enabled Systems, Wi-Fi, IoT, Li-Fi, GPS and Tracking Systems.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- analyse about various electronic devices.
- explain the concepts of electronic display systems.
- analyse the problems in various applications of smart home.
- elucidate the working principles of various home appliances.
- utilise the concepts of communication systems in various applications.

TEXT BOOKS

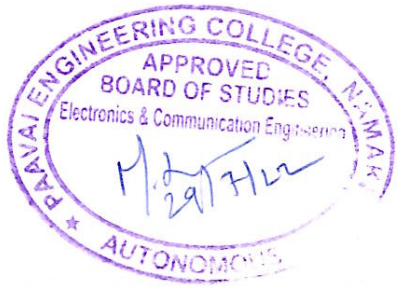
1. Thomas L Floyd "Electronic Devices" 10th Edition Pearson Education Asia 2018.
2. Philp Hoff "Consumer Electronics for Engineers" - Cambridge University Press.1998.

REFERENCES

1. Jordan Frith, "Smart phones as Locative Media ", Wiley. 2014.
2. Dennis C Brewer, "Home Automation", Que Publishing 2013.
3. Thomas M. Coughlin, "Digital Storage in Consumer Electronics", Elsevier and Newness 2012.
4. S P Bali, "Consumer Electronics, 1e, 1 January 2004

CO/PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak														
CO	**Programme Outcomes (PO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	-	3	-	2	-	-	-	-	-	-	-	3	3
CO2	3	2	2	-	1	-	-	-	-	-	-	-	3	3
CO3	3	2	2	-	1	2	2	-	-	-	-	-	3	3
CO4	2	2	1	-	-	1	-	-	-	-	-	-	3	3
CO5	3	2	2	2	-	-	2	-	-	-	-	-	3	3



EC20902 PRINCIPLES OF MODERN COMMUNICATION SYSTEMS 3 0 0 3
(Qualitative analysis only)

COURSE OBJECTIVES

To enable the students to

- understand the history of communication systems.
- learn the basics of mobile cellular communications.
- be familiar with wireless communication concepts.
- know the basics of satelite systems.
- acquire knowledge about radars systems.

UNIT I HISTORY OF COMMUNICATION 9

Evolution of electronic communication - smoke signals to smart phones, theoretical foundations, development and applications; Frequencies for communication - frequency regulations; overview of communication transmitter and receiver.

UNIT II MOBILE CELLULAR COMMUNICATIONS 9

Evolution to cellular networks - cellular systems generations and standards -1G, 2G, 3G, 4G ; cellular network components ; components of a mobile phone ; Spectrum allocation - Policies and strategies; Role of TRAI.

UNIT III WIRELESS COMMUNICATION 9

Bluetooth ; Infrared communication; IEEE Wireless LANs - Wi-Fi ; IEEE 802.16 - WiMaX; future mobile and wireless networks; 5G Architecture, applications ; deviceto device communication;

UNIT IV SATELLITE SYSTEMS 9

History of Satellite communication, basics of Satellites, types of Satellites, capacity allocation, launch Vehicles and Orbits - Introduction to launching vehicles, important Orbits, working of rocket, three Pioneers of Rocketry; basics of Global Positioning System - applications of GPS.

UNIT V RADAR AND NAVIGATION 9

Radar - block diagram, operation, Radar Frequencies, applications of Radar; Navigation Systems - Introduction, methods of navigation, Instrument Landing System, microwave landing system; Modern Navigation systems.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- elucidate the history of communication systems
- explore the basics of mobile cellular communications
- use wireless communication concepts for various applications

- explain the concepts involved in satellite systems
- develop applications using radar and navigation concepts

TEXT BOOKS

1. George Kennedy, Bernard Davis, S. R. M Prasanna," Kennedy's Electronic Communication Systems", 6th Edition McGraw Hill Education,2017
2. B.P.Lathi, "Modern Digital and Analog Communication Systems", 3/e, Oxford University Press,2007

REFERENCES

1. Gulati, "TV And Radar Engineering", New Age International Publishers,5th edition,2022
2. Rappaport Theodore S ,"Wireless Communications: Principles and Practice", 2nd edition, Pearson Education India, 2010
3. T.Pratt, C. Bostian and J.Allnutt; - "Satellite Communications", John Wiley and Sons, 2nd edition, 2010.
4. M. I .Skolnik, "Introduction to Radar Systems", Tata McGraw Hill 2006.

CO/PO MAPPING:

Mapping of Course Outcomes with Programme Outcomes (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Weak														
CO	**Programme Outcomes (PO)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	2	-	-	-	-	-	-	-	-	-	3	3
CO2	3	1	2	-	-	-	-	-	-	-	-	-	3	3
CO3	3	1	2	-	-	-	-	-	-	-	-	-	3	3
CO4	2	1	2	-	-	-	-	-	-	-	-	-	3	3
CO5	3	1	2	-	-	-	-	-	-	-	-	-	3	3