PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637 018

(AUTONOMOUS)

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

REGULATION 2015

CURRICULUM

SEMESTER V

Course Code	Course Title	L	T	P	C
EC15501	Digital Communication	3	0	0	3
EC15502	Microprocessors and Microcontrollers	3	0	0	3
EC15503	Digital Signal Processing	3	2	0	4
EC15504	Transmission Lines and Wave Guides	3	2	0	4
CH15501	Environmental Science and Engineering	3	0	0	3
*******	Elective I	3	0	0	3
EC15505	Microprocessor and Microcontroller Laboratory	0	0	4	2
EC15506	Digital Signal Processing Laboratory	0	0	4	2
EC15507	Communication and Networks Laboratory	0	0	4	2
EN15501	Career Development Laboratory I	0	0	2	1

SEMESTER VI

Course Code	Course Title	L	T	P	C
EC15601	Embedded Systems	3	0	0	3
EC15602	Antennas and Radars	3	0	0	3
EC15603	VLSI Design	3	0	0	3
*******	Elective II	3	0	0	3
EC1535*	Elective III	3	0	0	3
BA15151	Professional Ethics and Human Values	3	0	0	3
EC15604	Embedded Systems and Interfacing Laboratory	0	0	4	2
EC15605	VLSI Laboratory	0	0	4	2
EN15601	Career Development Laboratory II	0	0	2	1

LIST OF ELECTIVES

ELECTIVE I

Course Code	Course Title	L	T	P	C
EC15151	Computer Networks	3	0	0	3
EC15152	Speech Processing	3	0	0	3
EC15153	Operating Systems	3	0	0	3
MA15152	Numerical Methods	3	0	0	3

ELECTIVE II

Course Code	Course Title	L	T	P	C
EC15251	Medical Electronics	3	0	0	3
EC15252	Digital Switching and Transmission	3	0	0	3
EC15253	Advanced Microprocessors	3	0	0	3
BA15253	Total Quality Management	3	0	0	3

ELECTIVE III

Course Code	Course Title	L	T	P	C
EC15351	Digital Image Processing	3	0	0	3
EC15352	Computer Architecture	3	0	0	3
EC15353	Multimedia Compression Techniques	3	0	0	3
EC15354	Telecommunication System modeling and simulation	3	0	0	3

EC15501 DIGITAL COMMUNICATION 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- study the basics of different digital communication techniques.
- understand the concept of eye pattern to analyze ISI.
- study detection and estimation techniques used in receivers.
- acquire knowledge about the performance of various digital modulation techniques.
- understand the error control coding techniques for data transmission

UNIT I PULSE MODULATION 9

Sampling process – Quantization – PCM – Noise Consideration in PCM Systems – TDM – Differential Pulse Code Modulation – Adaptive Differential Pulse Code Modulation – Delta Modulation – Adaptive Delta Modulation.

UNIT II BASEBAND TRANSMISSION 9

Properties of Line Codes – Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ ISI – Nyquist criterion for distortion less transmission – Pulse shaping – Correlative coding – Eye Pattern – Equalization.

UNIT III DETECTION AND ESTIMATION 9

Gram-Schmidt Orthogonalization Procedure, Correlation Receiver, Matched Filter Receiver. Estimation: MAP Criteria, Maximum Likelihood Estimation.

UNIT IV DIGITAL MODULATION TECHNIQUES 9

Signaling scheme, Generation, Detection, Probability of error and Power Spectral Density of Coherent Modulation Techniques: BPSK, BFSK, QPSK, QAM – Non Coherent Binary Modulation Technique: FSK – Differential Phase Shift Keying.

UNIT V ERROR CONTROL CODING 9

Channel coding theorem – Linear block codes – Cyclic codes – Convolution codes – Viterbi Algorithm, Trellis Coded Modulation.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- apply the concept of sampling and pulse code modulation for analog signals.
- apply the concept of Eye pattern to analyze in ISI.
- comprehend the detection and estimation techniques used in receivers.
- compare about digital modulation techniques.

- apply channel coding techniques for data transmission.

TEXT BOOKS

1. Simon Haykin, “Digital Communication”, John Willey, student reprint, 2006.
2. John G.Proakis, “Digital Communication” McGraw Hill Fourth Edition, 2008.

REFERENCES

1. Bernard Sklar, “Digital Communication, Fundamentals and Applications” Pearson Education Asia, Second Edition, reprint, 2002.
2. B.P.Lathi, “Modern Digital and Analog Communication Systems”, Third Edition, Oxford Press,2007.
3. Leon W.Couch, “Digital and Analog Communication Systems, 6th Edition, Pearson Education, 2001.
4. A.F Molisch, ”Wireless Communication” John Wiley & Sons Ltd., 2005

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**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	1	1	2	1	-	-	2	-	-	2	3	3
CO2	3	2	1	1	2	-	-	-	2	-	-	2	3	3
CO3	3	-	-	1	2	1	-	-	-	-	-	2	3	3
CO4	3	-	-	1	2	-	-	-	-	-	-	2	3	3
CO5	3	2	1	1	2	1	-	-	2	-	-	2	3	3

EC15502 MICROPROCESSORS AND MICROCONTROLLERS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- study the architecture of 8086 microprocessor.
- learn the design aspects of I/O and Memory Interfacing circuits.
- import knowledge about the architecture of 8051 microcontroller.
- acquire knowledge about programming of 8086 microprocessor.
- understand the concepts of interfacing microcontroller

UNIT I 8086 MICROPROCESSOR 9

Evolution of Microprocessors – 8086 Microprocessor architecture – Pipelining – Cache memory – Addressing modes - Instruction set and assembler directives– Modular Programming – Connecting Microprocessor and I/O devices –Stacks– Macros – Interrupts and interrupt service routines – Byte and String Manipulation– Assembly language programming

UNIT II 8086 SYSTEM BUS STRUCTURE 9

8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Multiprogramming –Multiprocessor configurations –Closely coupled and loosely Coupled configurations – Coprocessor– Introduction to advanced processors.

UNIT III I/O INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, Keyboard display interface and Alarm Controller.

UNIT IV 8051 MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers (SFRs) – Ports of 8051 - Instruction set- Addressing modes - Assembly language programming – Introduction of PIC 16877

UNIT V INTERFACING MICROCONTROLLER 9

8051 Timer modes and Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC,DAC Interfacing - External Memory Interface –Case studies: Traffic light controller, Stepper Motor .

TOTAL PERIODS 45

COURSE OUTCOMES

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

- design and implement programs on 8086 microprocessor.
- analyze and design multiprocessor system
- explain the concept of I/O devices.

- elaborate the memory interfacing circuits.
- design and implement 8051 microcontroller based systems.

TEXT BOOKS

1. Krishna Kant, "Microprocessors and Microcontrollers Architecture, programming and system design using 8085, 8086, 8051 and 8096". PHI 2007.
2. Kenneth J.Ayala, "The 8051 Microcontroller Architecture, Programming and applications", Second edition, Penram International.

REFERENCES

1. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011
2. Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware",TMH,2012
3. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007.

Mapping of Course Outcomes with Programme Outcomes:

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

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

EC15503 DIGITAL SIGNAL PROCESSING 3 2 0 4

COURSE OBJECTIVES

To enable the students to

- learn discrete fourier transform and its properties
- know the characteristics of IIR filters, learn the design of infinite impulse response filters for filtering the undesired signals
- acquire knowledge about the characteristics of FIR filters, learn the design of finite impulse response filters for filtering the undesired signals
- understand Finite word length effects
- study the concept of digital signal processors and applications.

UNIT I DISCRETE FOURIER TRANSFORM 15

DFT and its properties, Relation between DTFT and DFT, Radix-2 FFT algorithms – butterfly diagram - DFT computation using Decimation in time and Decimation in frequency algorithms, Overlap-add and save Methods

UNIT II INFINITE IMPULSE RESPONSE FILTER DESIGN 15

Design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain - Design of IIR digital filters using impulse invariance technique- Design of digital filters using bilinear transform -pre warping -Realization of IIR Digital filters, Realization using direct, cascade and parallel forms.

UNIT III FINITE IMPULSE RESPONSE FILTER DESIGN 15

Linear phase FIR filters – Design using Rectangular, Hamming, Hanning and Blackmann Windows – Frequency sampling method – Realization of FIR filters – Direct form I and II, and Lattice structure

UNIT IV FINITE WORDLENGTH EFFECTS IN DIGITAL FILTERS 15

Fixed point and floating point number representations – Comparison – Quantization - Quantization Error - Quantization Noise Power – Zero input Limit Cycle Oscillations – Overflow Limit Cycle Oscillations – Signal Scaling.

UNIT V DIGITAL SIGNAL PROCESSORS AND APPLICATIONS 15

Overview of Digital Signal Processors – Selecting Digital Signal Processors – Applications of PDSPs – Von Neumann Architecture - Harvard Architecture – VLIW Architecture – Multiply Accumulate Unit (MAC) – Pipelining - Architecture of TMS320C50.

TOTAL PERIODS 75

COURSE OUTCOMES

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

- apply DFT for the analysis of digital signals and systems

- analyze the design IIR filters
- characterize the finite word length effect on filters
- explain the digital signal processors
- analyze the design IIR filters

TEXT BOOKS

1. John G. Proakis & Dimitris G.Manolakis, "Digital Signal Processing–Principles, Algorithms & Applications", Fourth Edition, Pearson Education / Prentice Hall, 2007.
2. Sanjit K. Mitra, "Digital Signal Processing–A Computer Based Approach", Tata Mc Graw Hill, 2007.

REFERENCES

1. Emmanuel C.Ifeachor, & Barrie.W.Jervis, "Digital Signal Processing", Second Edition, Pearson Education / Prentice Hall, 2002.
2. P.Ramesh Babu " Digital Signal Processing", Fourth Edition, Scitech,2007.
3. A.V.Oppenheim, R.W. Schafer and J.R. Buck,"Discrete-Time Signal Processing", 8th Indian Reprint, Pearson, 2004.

Andreas Antoniou, "Digital Signal Processing", Tata Mc Graw Hill, 2006.

Mapping of Course Outcomes with Programme Outcomes:

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

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

EC15504 TRANSMISSION LINES AND WAVEGUIDES 3 2 0 4

COURSE OBJECTIVES

To enable the students to

- be familiar with propagation of signals through lines
- understand signal propagation at radio frequencies
- understand radio propagation in guided systems
- study the concepts of resonators
- impart knowledge about the error control coding techniques for data transmission

UNIT I TRANSMISSION LINE THEORY AND PARAMETERS **15**

Introduction to different types of transmission lines , Transmission line Equation –Solution –Infinite line concept -Distortion less line –loading –input impedance, Losses in Transmission lines–Reflection loss, Insertion loss, return loss, Transmission line parameters at radio frequencies.

UNIT II IMPEDENCE MATCHING AND TRANSFORMATION **15**

Reflection Phenomena –Standing waves –λ/8, λ/4 & λ/2 lines- λ/4 Impedance transformers, Stub Matching – Single and Double Stub –Smith Chart and Applications – Solution of Problems using smith chart.

UNIT III FILTER DESIGN **15**

Characteristic impedance of symmetrical networks - Filter fundamentals, Design of filters: Constant K –LPF, HPF and BPF Filter design, m-derived filters - Composite filters, Fundamentals of Attenuators and Equalizers

UNIT IV RECTANGULAR WAVE GUIDES **15**

Waves between Parallel Planes –characteristic of TE , TM and TEM waves , Velocities of propagation, Solution of wave Equation in Rectangular guides ,TE and TM modes , Dominant Mode, Attenuation, Mode Excitation, rectangular cavity resonator.

UNIT V CYLINDRICAL WAVE GUIDES **15**

Solution of wave equation in circular guides, TE and TM wave in circular wave guides, Wave impedance, attenuation, Phase velocity and Group velocity , mode excitation, formation of cylindrical cavity, cavity resonator and Q for dominant mode.

TOTAL PERIODS 75

COURSE OUTCOMES

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

- explain the propagation of signals through transmission lines.
- analyze the signal propagation at radio frequencies.
- apply the radio propagation concepts in guided systems.

- elaborate the concept of filter design.
- utilize waveguides and cavity resonators in several applications.

TEXT BOOKS

1. John D Ryder “Networks lines and fields`` Prentice Hall of India, 2005.

REFERENCES

1. G.S.N Raju ”Electro Magnetic Field Theory and Transmission Lines ” Pearson Education, First edition 2005.
2. Bhag Guru & Hiziroglu,”Electromagnetic Field Theory Fundamentals`` Second edition Cambridge University press,2005
3. Annapurna Das Sisir K Das ,”Microwave Engineering`` Tata McGraw Hill, 2004

Mapping of Course Outcomes with Programme Outcomes:

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

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

CH15501 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- know the constituents of the environment and the precious resources in the environment
- conserve all biological resources.
- understand the role of human being in maintaining a clean environment and useful environment for the future generations
- acquire knowledge about ecological balance and preserve bio-diversity.
- understand the role of government and non-government organizations in environment management.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment: Definition- scope - importance – need for public awareness. Forest resources: Use –over exploitation- deforestation - case studies- mining - effects on forests and tribal people. Water resources: Use over utilization of surface and ground water- floods – drought - conflicts over water. Mineral resources-Use - exploitation - environmental effects of extracting and using mineral resources – case studies. Food resources: World food problems - changes caused by agriculture and overgrazing – effects of modern agriculture-fertilizer pesticide problems - water logging - salinity -case studies. Energy resources-Growing energy needs - renewable and non renewable energy sources. Land resources: Land as resource- land degradation - soil erosion. Role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem: Structure and function of an ecosystem – producers - consumers decomposers– energy flow in the ecosystem – ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem – grassland ecosystem – desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity: Introduction– definition (genetic - species –ecosystem) diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- hotspots of biodiversity. Threats to biodiversity Habitat loss - poaching of wildlife – man wildlife conflicts – endangered and endemic species of India Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity –field study.

UNIT III POLLUTION 9

Pollution: Definition –air pollution - water pollution - soil pollution - marine pollution - noise pollution thermal pollution – nuclearhazards. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - pollution case studies. Disaster management: Floods – earthquake - cyclone- landslides. Electronic waste-Sources-Causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT 9

Sustainable development: Unsustainable to sustainable development – urban problems related to energy. Water conservation - rain water harvesting - watershed management. Resettlement and rehabilitation of people. Environmental ethics: Issues - possible solutions – climate change - global warming and its effects on flora and fauna - acid rain - ozone layer depletion - nuclear accidents - nuclear holocaust – wasteland

reclamation. consumerism and waste products. Environment protection act: Air (Prevention and Control of Pollution) act - water (Prevention and control of Pollution) act – wildlife protection act – forest conservation act – issues involved in enforcement of environmental legislation.

UNIT V HUMAN POPULATION AND ENVIRONMENT **9**

Human population: Population growth - variation among nations – population explosion – family welfare programme and family planning – environment and human health– Human rights – value education – HIV/ AIDS Swine flu – women and child welfare. Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- explain the relationship between the human population and environment.
- gain the knowledge about ecosystem and biodiversity.
- elaborate the basic concepts of environment studies and natural resources.
- have knowledge about causes, effects and control measures of various types of pollution. ·
- understand the social issues and various environmental acts.

TEXT BOOKS

Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi,(2010).

Benny Joseph, "Environmental Science and Engineering", Tata McGra Hill, (2010).

REFERENCES

Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India,2010

S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001

W.P. Cunningham, Environmental Encyclopedia, Jaico Publising House, Mumbai, 2004

Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental

Mapping of Course Outcomes with Programme Outcomes:

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

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

EC15505 MICROPROCESSOR AND MICROCONTROLLER LAB 0 0 3 2

COURSE OBJECTIVES

To enable students

- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/O s with Microprocessors
- Be familiar with MASM

8086 Programs using kits and MASM

1 Basic arithmetic and Logical operations

2 Move a data block without overlap

3 Code conversion, decimal arithmetic and Matrix operations.

4 String manipulations, Sorting and Searching

5 Counters and Time Delay

Peripherals and Interfacing Experiments

6 Traffic light control

7 Stepper motor control

8 Key board and Display Control

9 Serial interface and Parallel interface

10 10. A/D, D/A interface and Waveform Generation

8051 Experiments using kits and MASM

TOTAL PERIODS 60

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- Write ALP Programs for fixed, Floating Point and Arithmetic
- Interface different I/O s with processor
- Execute Programs in 8051
- Explain the difference between simulator and Emulator

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
CO2	-	-	3	-	3	-	-	-	-	-	-		3	3
CO3	-	-	3	-	3	-	-	-	-	-	-		3	3
CO4	-	-	3	-	3	-	-	-	-	-	-		3	3

EC15506 DIGITAL SIGNAL PROCESSING LAB 0 0 4 2

COURSE OBJECTIVES

To enable students

- To implement Linear and Circular Convolution
- To implement FIR and IIR filters
- To study the architecture of DSP processor
- To know the generation of the signals and arithmetic operations using TMS320C5X DSP processor.

1 Generation of Signals
2 Linear Convolution
3 Circular Convolution
4 Spectrum Analysis using DFT
5 FIR filter design
6 IIR filter design
7 Study of architecture of Digital Signal Processor
8 Generation of waveform using Processor
9 Linear convolution using processor.
10 Circular convolution using processor

TOTAL PERIODS 60

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- Carry out simulation of DSP systems
- Demonstrate their abilities towards DSP processor based implementation of DSP systems
- Design of digital filter and Generation of various signals
- Computation of circular and linear convolution

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
CO2	-	-	3	-	3	-	-	-		-	-		3	3
CO3	-	-	3	-	3	-	-	-		-	-		3	3
CO4	-	-	3	-	3	-	-	-		-	-		3	3

EC15507 COMMUNICATION AND NETWORKS LAB 0 0 4 2

COURSE OBJECTIVES

To enable students

- To visualize the effects of sampling and DM and FM scheme
- To implement error control coding schemes and BPSK, QPSK and QAM schemes
- To study and implement the ARQ protocols
- To analyze the different routing Protocol
- To implement the Encryption and Decryption techniques

A. Communication Experiments

1 Implementation of signal sampling and reconstruction

2 Implementation of Delta modulation and Demodulation

3 Implementation of FM modulator and Demodulator

4 Simulation of Error control coding schemes-Linear block codes

5 Simulation of signal constellations of BPSK, QPSK and QAM

B. Networks Experiments

1 Implementation of Stop and wait protocol to provide reliable data transfer

2 Implementation of Go-back-N protocol to provide reliable data transfer

3 Implementation of Selective repeat protocol to provide reliable data transfer

4 Simulation and analysis of Distance vector routing protocol

5 Simulation and analysis of Link state routing protocol

6 Simulation and analysis of Encryption and Decryption techniques

TOTAL PERIODS 60

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- Demonstrate their knowledge in modulation and demodulation scheme through implementation of DM, FM, BPSK, QPSK and QAM
- Apply various channel coding schemes and demonstrate their capabilities towards the improvement of the noise performance of communication system
- Analyze the Flow control and Error control mechanism
- Implement the various routing algorithm
- Acquire the knowledge about the network security

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
CO2	-	-	3	-	3	-	-	-	-	-	-		3	3
CO3	-	-	3	-	3	-	-	-	-	-	-		3	3
CO4	-	-	3	-	3	-	-	-	-	-	-		3	3
CO4	-	-	3	-	3	-	-	-	-	-	-		3	3

EN15501 CAREER DEVELOPMENT LABORATORY I 0 0 2 1

COURSE OBJECTIVES

- To understand their capabilities & enhance their grooming and showcasing his/ her capabilities to a prospective employer
- To provide opportunity for the students to become acquainted with corporate opportunities relevant to their academic learning
- To articulate their thoughts on a given topic – in english and also to make decent write ups in english on any given topic
- To practice & score well in Aptitude tests conducted by corporates / prospective employers
- To prepare for any group discussion evaluation or presenting their credentials during a face- to-face interview leading to selection and employment

UNIT I PERSONALITY DEVELOPMENT 1 6

Introduction – self explorations – character building – self esteem- self confidence- positive thinking – leadership qualities- time management.

UNIT II PERSONALITY DEVELOPMENT 2 6

Grooming- role play – good etiquettes - extempore - writing skills: email, paragraph – team building- body language - non verbal communication

UNIT III QUANTITATIVE APTITUDE (QA) 1 6

Time , speed & distance -- simple interest & compound interest – percentage – height & distance – time & work – number systems – L.C.M & H.C.F – ratio proportion- area – directions.

UNIT IV LOGICAL REASONING (LR) 1 6

Analogies - letter & symbol series – number series – cause & effect – essential part – verbal reasoning.

UNIT V VERBAL REASONING (VR) 1 6

Blood relation – venn diagrams – analogy – character puzzles – logical sequence – classifiction –verification of truth – seating arrangement

TOTAL PERIODS 30

COURSE OUTCOMES

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

- demonstrate aptitude & reasoning skills
- enhance verbal & written ability.
- improve his/her grooming and presentation skills.
- interact effectively on any recent event/happenings/ current affairs.
- be a knowledgeable person on the various evaluation processes leading to employment and face the same with Confidence.

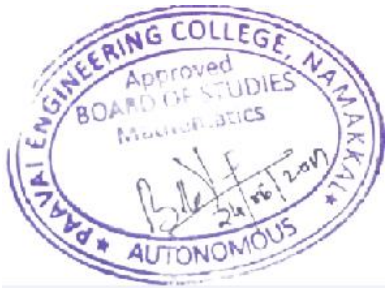
REFERENCES

1. Agarwal, R.S.” A Modern Approach to Verbal & Non Verbal reasoning”, S.Chand & co ltd, New Delhi.
2. Abhijit guha, “Quantitative Aptitude “, Tata-Mcgraw hill.
3. word power made easy by norman lewis ,W.R.Goyal publications.
4. Johnson, D.W. reaching out – interpersonal effectiveness and self actualization.Boston: Allyn and Bacon.
5. Agarwal, R.S.“ objective general English”,S.Chand & co
6. Infosys campus connect program – students’ guide for soft skills.

CO-PO MAPPING:

Mapping of Course Outcome (CO’s) with Programme Outcomes (PO’s) and Programme Specific Outcomes PSO’s (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	Programme Outcomes PO’s												PSO’s	
CO’s	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	3	3	1	-	-	-	-	-	-	3	2
CO2	-	2	3	-	2	-	2	-	-	-	-	-	3	2
CO3	3	2	2	2	-	-	1	-	-	-	-	-	2	3
CO4	3	2	2	-	-	1	-	-	-	-	2	-	2	3
CO5	2	3	3	2	1	3	3	1	-	1	2	-	2	3



EC15151 COMPUTER NETWORKS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the division of network functionalities into layers.
- be familiar with the different types of error in a networks
- know about the routing protocols
- learn the flow control and congestion control algorithms
- study the concept of encryption

UNIT I DATA COMMUNICATION AND PHYSICAL LAYER 9

Introduction, Data Communication - Components, Data flow; Networks- Criteria, Physical Structure, Topology, Types; Protocol layering, OSI Model, Internet Model, Physical Layer Services-Transmission Impairment, Transmission media, Guided media-Twisted pair cable, Coaxial cable, Fiber optic cable. Switching - Circuit switching networks, Packet switching networks.

UNIT II DATA LINK LAYER 9

Services, Link-Layer Addressing, Types of Errors, Error Detection, Cyclic Redundancy Check, Checksum, Forward Error Correction, CSMA/CD, CSMA/CA, IEEE 802.3, IEEE802.11, Bluetooth

UNIT III NETWORK LAYER 9

Services, Performance, IPV4 addresses, Classful Addressing, Classless Addressing, DHCP, ICMP, IGMP, IPV6, Routing algorithm- Distance-Vector Routing, Link-State Routing, and Path-Vector Routing, Unicasting - RIP, OSPF. Multicast routing DVMRP, PIM.

UNIT IV TRANSPORT LAYER 9

Services, Connectionless and Connection-Oriented Protocols, Port Numbers, UDP, TCP, TCP connection establishment, TCP flow Control, Error Control, TCP Congestion control. QoS.

UNIT V APPLICATION AND NETWORK SECURITY 9

WWW, Domain Name Space (DNS), HTTP, SMTP, E-Mail; Network Security- Security Goals, Services and Techniques, Symmetric-Key Ciphers, Asymmetric-Key Ciphers and Digital Signature.

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 networks
- apply the error detection techniques to send data in a network
- construct the routing algorithm
- explain the congestion control techniques
- apply the security authentication in a various network

TEXT BOOKS

1. Behrouz A. Foruzan, Data communications and Networking, The McGraw-Hill Companies, Inc. 2013, 5th edition.

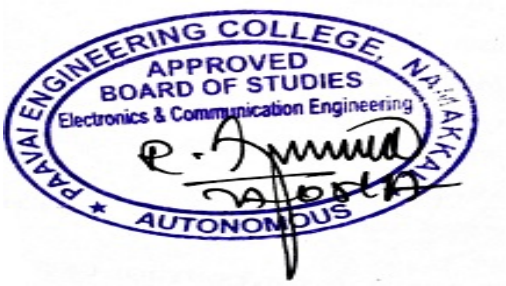
REFERENCES

1. William Stallings, Data and Computer Communication, PHI 2010.
2. Larry L.Peterson & S.Peter Davie, Computer Networks, Harcourt, 2008.
3. James F.Kurose & Keith W.Ross, Computer Networking A Top-down Approach Featuring the Internet, PHI, 2007.
4. Andrew S.Tannenbaum, Computer Networks, PHI, 2010.

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**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	3	2	-	-	-	-	2	-	-	3	3	3
CO2	3	3	3	2	-	-	-	-	2	-	-	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	2	-	-	-	-	2	-	-	3	3	3



EC15152 SPEECH PROCESSING **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- To introduce speech production and related parameters of speech
- To understand the time domain methods for speech processing
- To study the frequency domain techniques for estimating speech parameters
- To learn about the predictive technique for speech compression.
- To understand speech recognition, synthesis and speaker identification

UNIT I NATURE OF SPEECH SIGNAL **9**

Speech production mechanism, Classification of speech, Sounds, Nature of speech signal, Models for speech production. Speech signal processing: purpose of speech processing, Digital models for speech signal, Digital processing of speech signals, Significance, Short time analysis.

UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING **9**

Time domain parameters for speech, methods for extracting the parameters, Zero crossings, Auto correlation function, pitch estimation.

UNIT III FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING **9**

Short time Fourier analysis, filter bank analysis, spectrographic analysis, Format extraction, pitch Extraction, Analysis- Synthesis systems.

UNIT IV LINEAR PREDICTIVE CODING OF SPEECH **9**

Formulation of linear prediction problem in time domain, solution of LPC equations, Interpretation of Linear Prediction in auto correlation and spectral domains.

UNIT V SPEECH SYNTHESIS AND ANALYSIS **9**

Central analysis of speech, format and pitch estimation, Applications of speech processing, Speech Recognition, Speech synthesis and speaker verification.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- analyze the basics of speech production and related speech parameters.
- comprehend the time domain methods of speech processing
- develop frequency domain techniques for speech parameters estimation
- design predictive techniques for speech compression
- use different speech synthesis techniques

TEXT BOOKS

L.R.Rabiner and R.E.Schafer, "Digital processing of speech signals, Dorling Kindersley (India) Private Limited , 2011

REFERENCES

1. L.Rabiner and Biling Hwang Juang, "Fundamentals of Speech recognition", Pearson Education, 2003.
2. J.L.Flanagan, "Speech Analysis Synthesis and Perception", 2nd Edition- Springer Verlag, 1972.
3. I.H.Witten, "Principles of Computer Speech", Academic press, 1983
4. Thomas F.Quateri, "Discrete-Time Speech Processing – Principles and Practice" , Pearson Education, 2004

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**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	3	-	3	-	-	-	-	-	-	-	3	3
CO2	-	-	3	-	3	-	-	-	-	-	-	-	3	3
CO3	-	-	3	-	3	--	-	-	-	-	-	-	3	3
CO4	-	-	3	-	3	-	-	-	-	-	-	-	3	3
CO5	-	-	3	-	3	-	-	-	-	-	-	-	3	3

EC15153 **OPERATING SYSTEMS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- To study the basic concepts and functions of operating systems.
- To understand the structure and functions of OS.
- To learn about processes, threads and scheduling algorithms.
- To understand the principles of concurrency and deadlocks.
- To learn various memory management schemes.

UNIT I **INTRODUCTION** **9**

Introduction: Computer system organization - Introduction to operating systems – operating system structures – Services - System calls – System programs. Processes: Process concept – Process scheduling – Operations on Processes – Cooperating processes – Inter process communication – Communication in client-server systems. Threads: Multi-threading models – Threading issues. Case Study: Pthreads library

UNIT II **PROCESS MANAGEMENT AND DEADLOCK** **10**

CPU Scheduling: Scheduling criteria – Scheduling algorithms – Multiple - processor scheduling – Real time scheduling – Algorithm Evaluation. Process Synchronization: The critical-section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – Monitors. Deadlock: System model – Deadlock Characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance –Deadlock detection – Recovery from deadlock. Case Study: Process scheduling in Linux.

UNIT III **MEMORY MANAGEMENT** **9**

Main Memory: Background – Swapping – Contiguous memory allocation –Paging – Segmentation – Segmentation with paging. Virtual Memory: Background –Demand paging – Page replacement – Allocation of frames –Thrashing. Case Study: Memory management in windows and Solaris

UNIT IV **FILE SYSTEMS** **9**

File-System Interface: File concept – Access methods – Directory structure – File system mounting – File sharing - Protection. File-System Implementation: Directory implementation – Allocation methods – Free-space management – efficiency and performance – recovery – Network file systems. Case studies: File system in Windows XP.

UNIT V **I/O SYSTEMS AND MASS STORAGE MANAGEMENT** **8**

I/O Systems – I/O Hardware – Application I/O interface – kernel I/O subsystem –streams performance. Mass-Storage Structure: Disk attachment - Disk scheduling – Disk management –Swap-space management – RAID –stable storage. Case study: I/O in Linux.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- design various scheduling algorithms.
- apply the principles of concurrency.
- design deadlock, prevention and avoidance algorithms.
- compare and contrast various memory management schemes.
- schedule and manage the disk effectively .

TEXT BOOKS

Silberschatz, Galvin, and Gagne, "Operating System Concepts", Ninth Edition, Wiley India Pvt Ltd, 2013.

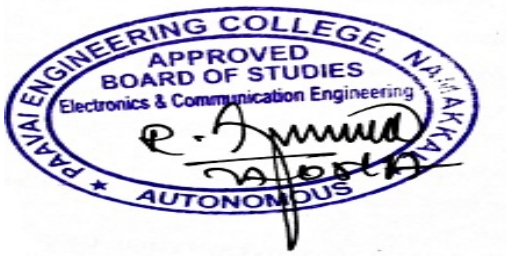
REFERENCES

1. Andrew S. Tanenbaum, "Modern Operating Systems", Fourth Edition, Pearson Education, 2014.
2. William Stallings, "Operating Systems – internals and design principles", Prentice Hall, 7thEdition, 2011.
3. Harvey M. Deital, "Operating Systems", Third Edition, Pearson Education, 2007.
4. Andrew S. Tannenbaum & Albert S. Woodhull, "Operating System Design and Implementation", Prentice Hall, 3rd Edition, 2006.
5. Gary J.Nutt, "Operating Systems", Pearson/Addison Wesley, 3rd Edition, 2004.

Mapping of Course Outcomes with Programme Outcomes:

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

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



MA15152 NUMERICAL METHODS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- analyze different methods to find solution for a large system of near equations
- find the intermediate values for a series of given data
- develop efficient algorithms for solving problems in science, engineering and technology
- solve the non linear differential equations that cannot be solved by regular conventional method.
- apply finite element method to increase the accuracy of second order differential equations

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9

Solution of equation –Iteration method : Newton Raphson method – Solution of linear system by Gaussianelimination and Gauss - Jordon method – Iterative method – Gauss-Seidel method – Inverse of a matrix by Gauss Jordon method – Eigenvalue of a matrix by power method.

UNIT II INTERPOLATION AND APPROXIMATION 9

Lagrangian Polynomials – Divided differences – Newton's Divided Difference, Hermite Interpolation Polynomial and Interpolating with a cubic spline – Newton's forward and backward difference formulas

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9

Differentiation using interpolation formulae –Numerical integration by trapezoidal and Simpson's 1/3– Romberg's method – Two and Three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpsons' rule.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Single step methods: Taylor series method – Modified Euler method for first order equation – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- comprehend the basics of linear equations.

- apply the interpolation methods for constructing approximate polynomials
- demonstrate the knowledge of numerical differential equations in computational and simulation process
- utilize the concept of initial value problems in the field of science and engineering
- describe the computational procedure of the amount of heat emitted or transferred from an object

TEXT BOOKS

1. Erwin Kreyszig., "Advanced Engineering Mathematics" 10th edition, Wiley Publications, 2010.
2. T. Veerarajan. and T .Ramachandran, "Numerical Methods with programming in C", 2nd ed., Tata McGraw-Hill, 2006.
3. Sankar Rao K " Numerical Methods For Scientisits And Engineers –3rd Edition Princtice Hall of India Private, New Delhi, 2007.

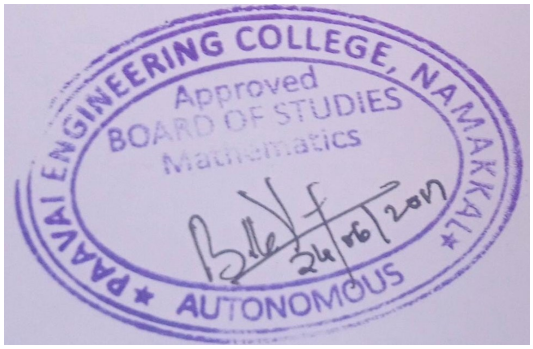
REFERENCES

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003
2. Gerald C.F. and Wheatley, P.O., "Applied Numerical Analysis" 6th Edition, Pearson Education Asia, New Delhi, 2002
3. M.K.Jain , S.R.K. Iyangar , R.K.Jain , "Numerical Methods For Scientific & Engineering Computation" New Age International (P) Ltd , New Delhi , 2005.
4. M.B.K. Moorthy and P.Geetha, "Numerical Methods" , Tata McGraw Hill Publications company, New Delhi, 2011.

Mapping of Course Outcomes with Programme Outcomes:

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

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



EC15601 EMBEDDED SYSTEMS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- study the overview of embedded system architecture.
- learn various embedded communication protocols.
- exposed to the basic concepts of real time operating system
- learn the architecture and programming of ARM processor.
- learn the applications of embedded systems.

UNIT I ARCHITECTURE OF EMBEDDED SYSTEMS 9

Categories of Embedded Systems-Specifications of Embedded systems Resent trends in Embedded Systems-Hardware Architecture-Software Architecture-Communication software-Process of generation of executable image development/testing tools.

UNIT II EMBEDDED COMMUNICATION PROTOCOLS 9

Serial/Parallel Communication - Serial communication protocols - UART - RS232 standard – Serial Peripheral Interface - Inter Integrated Circuits – Ethernet - Universal serial Bus - Controller Area Network - Parallel communication protocols – ISA / PCI Bus protocols.

UNIT III REAL-TIME OPERATING SYSTEM CONCEPTS 9

Architecture of the Kernel-task and task scheduler-Interrupt Service Routines Semaphores-Mutex-Mailboxes-Message Queues-Event Registers-Pipes-Signals Timers-Memory Management – Priority Inversion Problem

UNIT IV ARM ARCHITECTURE 9

Advanced RISC Machine – Architecture Inheritance – ARM Programming Model – ARM Development Tools – 3 and 5 stages Pipeline ARM Organization – ARM Instruction Execution and Implementation – ARM Co-Processor Interface - Thumb bit in the CPSR – Thumb programmer's model.

UNIT V APPLICATION OF EMBEDDED SYSTEM 9

Data compressor - Alarm Clock - Audio player - Software modem-Digital still camera - Telephone answering machine Engine control unit – Video accelerator.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- describe hardware and software architectures of embedded systems.
- analyze the devices and buses used for embedded networking.
- interpret the concepts of a real time operating System.
- analyze the special features of ARM architecture.

- model real-time applications using embedded-system concepts.

TEXT BOOKS

K.V.K.K.Prasad "Embedded /Real-Time Systems: Concepts, Design and Programming "Dreamtech, Wiley 2003.

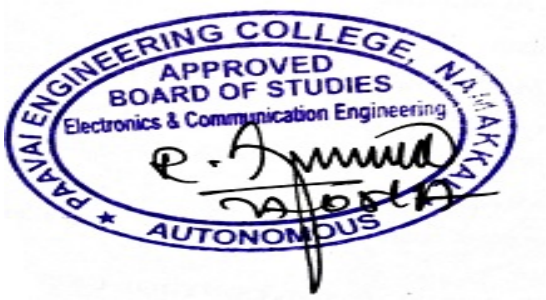
REFERENCES

1. Raj Kamal, "Embedded Systems Architecture Programming and Design", Second Edition, MH, 2010
2. Andrew N.Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide Designing and Optimizing System Software", Morgan Kaufmann Publishers, Elsevier, 2004.
3. Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", Third Edition Cengage Learning, 2012.
4. David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.

Mapping of Course Outcomes with Programme Outcomes:

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

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



EC15602 ANTENNAS AND RADARS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- give an insight of the antenna basic concepts
- give a thorough understanding of the radiation characteristics of different types of antennas
- create awareness about the RADARs at different frequencies
- acquire the knowledge of antenna arrays
- learn about special antennas and their measurements.

UNIT I ANTENNA FUNDAMENTALS 9

Antenna parameters – Gain and Directivity, Radiation intensity, Beam solid angle ,Effective aperture, Radiation Resistance, Beam width, Input Impedance. Matching Baluns, Reciprocity Principle, Polarization, Antenna noise temperature, Radiation from Hertzian dipole, Half wave dipole

UNIT II APERTURE AND LENS ANTENNAS 9

Radiation from rectangular apertures, Uniform and Tapered aperture- Horn antenna , Reflector antenna -Types & feed systems, Dielectric lens and metal plane lens antennas- Slot antennas

UNIT III ANTENNA ARRAYS 9

N element linear array, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Pattern multiplication, Basic principle of antenna Synthesis-Binomial array

UNIT IV SPECIAL ANTENNAS AND ANTENNA MEASUREMENTS 9

Special Antennas: Helical, Log periodic, Yagi-Uda & Micro-strip patch antenna and its Application. Antenna Measurements- Radiation Pattern, Gain & Directivity Measurements.

UNIT V INTRODUCTION TO RADARS 9

Basic Introduction of Radar and Simple form of Radar Equation-Radar Block Diagram and its Frequencies Introduction to Doppler effect-CW Radar- FMCW Radar-MTI Radar-Delay-Line Cancellers - Applications of Radar.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- explain the various types of antennas and wave propagation
- elaborate about aperture and lens antennas.
- analyze the various antenna arrays.
- characterize special antennas and their measurements.
- explain the different types of radars

TEXT BOOKS

1. John D Kraus," Antennas for all Applications", 3rd Edition, Mc Graw Hill, 2005.
2. K.D. Prasad, "Antennas and Wave Propagation", Sathya prakasan Tech India Publications- New Delhi 2015.

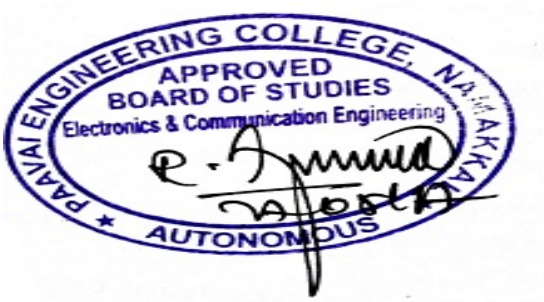
REFERENCES

1. Edward C.Jordan and Keith G.Balmain" Electromagnetic Waves and Radiating Systems" Prentice Hall of India, 2006.
2. Rajeswari Chatterjee, "Antenna Theory and Practice" Revised Second Edition New Age International Publishers, 2006.
3. Peyton Z. Peebles:, "Radar Principles", John wiley, 2004.
4. J.C Toomay, " Principles of Radar", 2nd Edition –Prentice Hall India, 2004.

Mapping of Course Outcomes with Programme Outcomes:

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

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



EC15603 VLSI DESIGN 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the MOS circuit realization of the various building architectural choices.
- study the transistor circuit level design and realization for digital operation
- impart knowledge about various circuit characteristics and performance estimation
- gain the knowledge about testing of CMOS
- study the basics of VHDL in different types of modeling.

UNIT I MOS TRANSISTOR THEORY AND PROCESS TECHNOLOGY 9

NMOS and PMOS transistors –Threshold voltage –Body effect –Design equations–Second order effects –MOS models and small signal AC characteristics –Basic CMOS Technology

UNIT II INVERTERS AND LOGIC GATES 9

NMOS and CMOS inverters –Stick diagram –Inverter ratio –DC and transient characteristics –CMOS logic structures –Transmission gates –Static CMOS design –Dynamic CMOS design

UNIT III CIRCUIT CHARACTERISATION AND PERFORMANCE ESTIMATION 9

Resistance estimation –Capacitance estimation –Inductance –Switching characteristics Transistor sizing –Power dissipation and design margining –Charge sharing –Scaling

UNIT IV CMOS TESTING 9

Need for testing-Fault models-observability, controllability, fault coverage-Design for testability-Ad-Hoc testing-scan based test techniques-self test techniques-Boundary scan.

UNIT V VERILOG HARDWARE DESCRIPTION LANGUAGE 9

Overview of digital design with Verilog HDL –Hierarchical modeling concepts–Modules and port definitions –Gate level modeling–Data flow modeling –Behavioral modeling-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

- analyse the basic concepts of MOS transistor logic.
- design inverters and logic gates.
- comprehend CMOS characteristics
- analyse the basic CMOS circuits and the CMOS process technology
- model the digital system using hardware description language.

TEXT BOOKS

Neil H. E. Weste and Kamran Eshraghian, “Principles of CMOS VLSI Design”,2nd edition,Pearson Education Asia, 2000.

REFERENCES

1. John P. Uyemura, "Introduction to VLSI Circuits and Systems", John Wiley and Sons, Inc., 2002.
2. Samir Palnitkar, "Verilog HDL", 2nd Edition, Pearson Education, 2004.
3. Pucknell, "Basic VLSI Design", Prentice Hall of India Publication, 1995
4. Wayne Wolf, "Modern VLSI Design System on chip", Pearson Education, 2002
5. Bhasker J., "A Verilog HDL Primer", 2nd Edition, B. S. Publications, 2001.

Mapping of Course Outcomes with Programme Outcomes:

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

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

BA15151 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OBJECTIVES

- To understand the basic human values for a professional.
- To discuss the significance of ethics in engineering and the theories related to it.
- To familiarize oneself with the role of engineer as responsible experimenters.
- To expose the students to their roles and responsibilities in assessing safety and reducing risks.
- To describe the global issues in ethics and role of engineers as manager and consultants.

UNIT I HUMAN VALUES 9

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Cooperation – Commitment – Empathy – Self-Confidence – Character – Spirituality

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas- moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles – theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics – a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights – Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- describe the basic human values for a professional.
- understand the significance of ethics in engineering and the theories related to it.
- be familiar with the role of engineer as responsible experimenters.
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks.
- discuss the global issues in ethics and role of engineers as manager and consultants.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, “Engineering Ethics –Concepts and Cases”,

REFERENCES

1. Charles D Fleddermann, “Engineering Ethics”, Prentice Hall, New Mexico, (1999).
2. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, (2003).
3. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, (2001).
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, “Business Ethics – An Indian Perspective”,Biztantra, New Delhi, (2004).
5. David Ermann and Michele S Shauf, “Computers, Ethics and Society”, Oxford University Press, (2003).

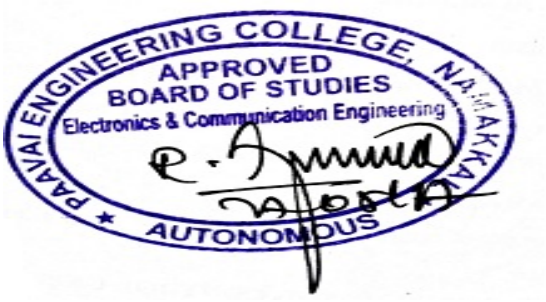
WEB LINKS

1. http://nptel.ac.in/courses/106108101
2. http://www.learnerstv.com

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	-	3	-	-
CO2	-	-	-	-	-	3	-	3	3	3	-	3	-	-
CO3	-	-	-	-	-	3	-	3	3	3	-	3	-	-
CO4	-	-	-	-	-	3	-	3	3	3	-	3	-	-
CO5	-	-	-	-	-	3	-	3	3	3	-	3	-	-



EC15604 EMBEDDED SYSTEMS AND INTERFACING LABORATORY 0 0 4 2

COURSE OBJECTIVES

- To understand the building blocks of embedded systems
- To learn the concept of memory map and memory interface
- To know the characteristics of real Time Systems
- To write programs to interface memory, I/O s with processor

LIST OF EXPERIMENTS

1. Interface Switches and LED's
2. Interface LCD and Display "Hello World"
3. Interface 4*4 Matrix Pad
4. Interfacing Seven segments
5. Flashing of LEDS
6. Interfacing LED and PWM.
7. Interfacing EPROM and interrupt.
8. Interfacing RTC
9. Images read and write in GLCD
10. Touch screen interface with ARM

TOTAL PERIODS 60

COURSE OUTCOMES

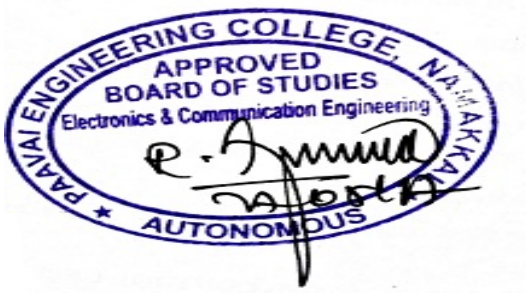
At the end of this course, the students will be able to

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

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	-	-	-	-	-	3	3
CO2	-	3	-	3	3	-	3	-	-	-	-	-	3	3
CO3	-	3	-	3	3	-	3	-	-	-	-	-	3	3
CO4	-	3	-	3	3	-	3	-	-	-	-	-	3	3



EC15605 **VLSI LABORATORY** **0 0 4 2**

COURSE OBJECTIVES

- To implement combinational and sequential circuits using FPGA
- To study and implement combinational circuits using schematic entry
- To implement Traffic light controller using FPGA
- To study and implement CMOS circuits using Microwind. **List of Experiments**

1. Design and Simulation of Combinational circuits
2. Design and Simulation of Sequential Circuits
3. Implementation of Combinational circuits using FPGA
4. Implementation of Sequential Circuits using FPGA
5. Design and Implementation of Combinational circuits using Schematic entry
6. To study pin assignment, placement and routing using FPGA
7. Implementation of Traffic light controller using FPGA
8. Design and Implementation of Inverter using Microwind
9. Design and Implementation of basic logic gates using Microwind
10. To study the characteristics of CMOS circuits using Microwind

TOTAL PERIODS 60

COURSE OUTCOMES

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

- design the combinational and sequential circuits
- analyze pin assignment, placement and routing using FPGA
- implement traffic light controller using FPGA
- design the CMOS circuits and basic logic gates using microwind

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	3
CO2	-	-	3	3	3	-	-	-	-	-	-	-	3	3
CO3	-	-	3	3	3	-	-	-	-	-	-	-	3	3
CO4	-	-	3	3	3	-	-	-	-	-	-	-	3	3

EN15601 CAREER DEVELOPMENT LABORATORY II 0 0 2 1

COURSE OBJECTIVES

- To enhance career competency and employability skills
- To demonstrate effective leadership and interpersonal skills
- To improve professional capabilities through advanced study and researching current market strategy.
- To develop problem solving and decision making capabilities
- To improve their reasoning skills to get placed in reputed companies

UNIT I CORPORATE READINESS 6

Business Communication – Inter and Intra Personal skills – Business Etiquettes – Corporate ethics – Communication media Etiquette.

UNIT II INTERVIEW SKILLS 6

Resume building – Group discussions – Presentation skills – Entrepreneur skills – Psychometric assessment – Mock interview.

UNIT III QUANTITATIVE APTITUDE (QA) 2 6

Profit and Loss – Clock – Power and Square roots – Train – Boats and streams – Probability – Calendars – Permutations and Combinations - Partnership – Simplification – Pipes and Cisterns – Puzzles.

UNIT IV LOGICAL REASONING (LR) 2 6

Statements and Assumptions – Matching Definitions – Logical Games – Making judgments – Statements and conclusions – Verbal classifications.

UNIT V VERBAL REASONING (VR) 2 6

Syllogisms – Data sufficiency – Dice – Series completion – Character puzzles – cube and cuboids – Arithmetic Reasoning.

TOTAL PERIODS 30

COURSE OUTCOMES

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

- develop team work capabilities
- boost their problem solving skills
- enhance the transformation from college to corporate.
- compute problems based on quantitative aptitude
- reveal their logical and verbal reasoning by scoring the expected percentage to get placed in reputed companies

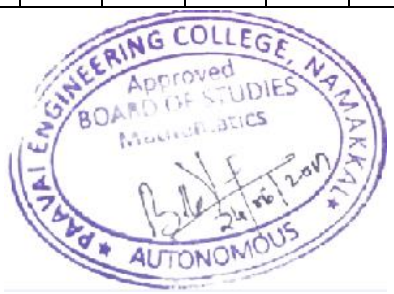
REFERENCES

1. Agarwal, r.s.” a modern approach to verbal & non verbal reasoning”, , S.Chand & co ltd, New Delhi.
2. Abhijit guha, “quantitative aptitude for competitive examinations “, Tata Mcgraw hill
3. Word power made easy by norman lewis ,wr.goyal publications.
4. Johnson, d.w. (1997). Reaching out – interpersonal effectiveness and self Actualization -- Boston: Allyn and bacon.
5. Infosys Campus Connect Program – students’ guide for soft skills.
6. Mitra ,barun.k, “ Personalaity Development & Softskills “ , Oxford University.

CO-PO MAPPING:

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

	PO's												PSO's	
CO's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2	3	3	1	-	-	-	-	-	-	3	2
CO2	-	2	3	-	2	-	2	-	-	-	-	-	3	2
CO3	3	2	2	2	-	-	1	-	-	-	-	-	2	3
CO4	3	2	2	-	-	1	-	-	-	-	2	-	2	3
CO5	2	3	3	2	1	3	3	1	-	1	2	-	2	3



EC15251 MEDICAL ELECTRONICS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- gain knowledge about the various physiological parameters both electrical and non-electrical and the methods of recording.
- get clear idea about the method of transmitting those parameters.
- study about the various assist devices used in the hospitals.
- gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic technique
- learn about the recent trends in Medical Instrumentation.

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

The origin of Bio-potentials: Bio potential electrodes, Biological amplifier – Difference amplifier and chopper amplifier, ECG, EEG, EMG, PCG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II NON ELECTRICAL PARAMETER MEASUREMENT 9

Auto analyzer, Blood flow meter, Cardiac output, Respiratory measurement, Blood Pressure, Blood cell Counters

UNIT III ASSIST DEVICES 9

Cardiac Pacemakers, Classification of Pacemakers, DC Defibrillator, Dialyzer, Heart lung machine.

UNIT IV LASER, DIATHERMIES AND ULTRASONIC APPLICATIONs 9

Principle of Laser action, Different types and clinical applications of laser, Ultrasonic frequency for medical application , Diathermies-Shortwave, Ultrasonic and Microwave type and their applications, Surgical Diathermy, Radio-pill.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Principle and application of Thermography, Principle and application of Nanotechnology, Endoscopy and Ophthalmic equipment's, Principles of Lithotripsy.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- compare the concepts about electro-physiology, ECG,EEG, EMG and PCG.
- apprehend the different types of measurements in Non-electrical parameter.
- analyse the functions of various machines to save human life
- examine the concept of laser, ultrasonic which is involved in medical field.
- apply the recent trends in field of diagnostic and therapeutic equipment's

TEXT BOOKS

Leslie Cromwell , Fred J.Weibell and Erich A.Pfeiffer - Biomedical Instrumentation Prentice Hall New Delhi 2000.

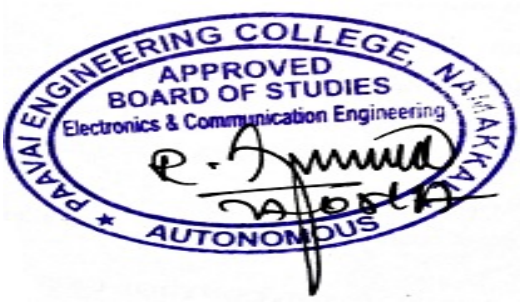
REFERENCES

1. Albert M Cook and Webster J G – Therapeutic medical devices Prentice Hall Nee York 1982
2. Khandpur R.S Hand Book of Biomedical Instrumentation – Tata McGraw Hill publication , New Delhi 2nd edition 2003
3. Leslie Cromwell , Fred J.Weibell and Erich A.Pfeiffer - Biomedical Instrumentation Prentice Hall New Delhi 2000
4. Jacobson B and Webster J G Medical and Clinical Engineering – Prentice Hall of India New Delhi 1999
5. Wolbasrsht . M. L, Laser Application in Medicine and Biology plenum press NewYork 1989.
6. Heinz Kresse – Handbook of Electro medicine. John Wiely& Sons – Chrchester– 1985.

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	-	-	-	-	-	3	3	3	3
CO2	3	3	3	-	3	-	-	-	-	-	3	3	3	3
CO3	3	3	3	-	3	-	-	-	-	-	3	3	3	3
CO4	3	3	3	-	3	-	-	-	-	-	3	3	3	3
CO5	3	3	3	-	3	-	-	-	-	-	3	3	3	3



EC15252 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 various transmission schemes for telephony and broadband
- study the methods of modeling and analysis techniques for data transmission
- understand the different Switching Techniques
- know the telegraphic engineering in digital networks

UNIT I INTRODUCTION 9

Overview of existing Voice, Data and Multimedia Networks and Services; Review of Basic Communication principles; Synchronous and Asynchronous transmission, Line Codes

UNIT II TRUNK TRANSMISSION 9

Multiplexing and Framing- types and standards; Trunk signaling; Optical Transmission-line codes and Muxing: SONET/SDH; ATM; Microwave and Satellite Systems.

UNIT III LOCAL LOOP TRANSMISSION 9

The Analog Local Loop; ISDN local loop; DSL and ADSL; Wireless Local Loop; Fiber in the loop;Mobile and Satellite Phone local loop.

UNIT IV SWITCHING 9

Evolution; Space switching, Time switching and Combination Switching; Blocking and Delay characteristics; Message ,Packet and ATM switching; Advances in switching techniques – shared memory fast packet switches, shared medium fast packet switches and space division fast packet switches, Photonic switching- Optical TDM, WDM.

UNIT V TELETRAFFIC ENGINEERING 9

Telecom Network Modeling; Arrival Process; Network Blocking performance; Delay Networks Queing system analysis and delay performance.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- examine the different types of signaling in digital telephony.
- analyze the various transmission schemes for telephony and broadband
- apply the methods of modeling and analysis techniques for data transmission
- compare the different switching techniques
- examine the telegraphic engineering in digital networks

TEXT BOOKS

J. Bellamy, “Digital Telephony”, John Wiley, 3rd Edition, 2003.

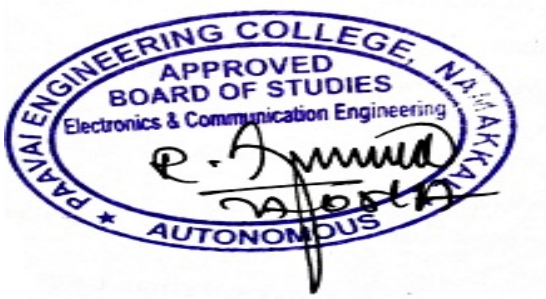
REFERENCES

1. J.E.Flood, “Telecommunication Switching, Traffic and Networks”, Pearson, 2007
2. ThiagarajanViswanathan, “Telecommunication Switching Systems and Networks”, Prentice Hall India, 1992, Twenty - Sixth Reprint, 2006.

Mapping of Course Outcomes with Programme Outcomes:

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

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



EC15253 ADVANCED MICROPROCESSORS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- study the concepts of architecture and assembly language programming of ARM Processor.
- understand the concepts of 32 bit processor
- know the concepts of pentium processor
- learn the concepts of RISC processor
- know the relevance of motorola processors

UNIT I OVERVIEW OF 16 BIT PROCESSOR 9

Need of advanced microprocessors: 80186 Microprocessor Architecture - Segmented Memory - Addressing Modes -Instruction Set - 80186 Assembly Language Programming - co processor 80187 Data Processor Architectural details - Data types - Floating point Operations – 80187 Instructions

UNIT II INTEL 32-BIT PROCESSOR 9

Architectural details of 80386 Microprocessor - Special registers - Memory management-Operation in protected mode and virtual 80386 mode - Memory paging mechanism -Special instructions of 80386 - Architectural details of 80486 - Special registers - Additional instructions - Comparison of 80386 and 80486 processors

UNIT III HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM 9

Introduction to Pentium Processor - Architectural features - Comparison with the workstations - Branch prediction logic - cache structure. - Special Pentium Registers. Memory management - virtual mode of operation - Comparison with the previous processors. Features of Pentium-II, Pentium-III and Pentium Pro-processors

UNIT IV RISC PROCESSOR 9

RISC Microprocessors – RISC Vs CISC – RISC Properties – DEC Alpha AXP Architecture - Power PC – Architecture - Programming Model – Data Types –Addressing Modes – Instruction Set. Sun SPARC – Architecture – Data Types –Instruction Sets - Features of MIPS, AMD Microprocessors

UNIT V MOTOROLA PROCEESORS 9

Motorola Microprocessors – 68000 Microprocessor – Architecture – Registers –Addressing Modes – Features of 68020 – 68030 – 68040 Microprocessors

TOTAL PERIODS 45

COURSE OUTCOMES

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

- apply the concepts of 16-bit processor
- analyse the concepts of 32-bit processor

- evaluate about PENTIUM processors and CPU cores.
- compare various RISC processors
- evaluate the relevance of motorola processors

TEXT BOOKS

1. Barry B Brey "Intel Microprocessors : 8086/88, 80186/188, 80286, 80386, 80486,Pentium, Pentium – II, Pentium – III and Pentium – IV, Architecture, Programming& Interfacing", Pearson Education, 2003
2. Steve Furber, ARM System on Chip Architecture, Addison –Wesley Professional, 2000. "A Course in Electrical & Electronic Measurements and Instrumentation", DhanpatRai and Co, 2004.

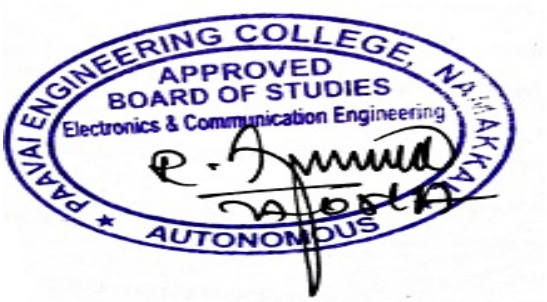
REFERENCES

1. Jason Andrews, o-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology), ewnes, BK and CD-ROM, Aug 2004.
2. L. James Antonakos, The Pentium Microprocessor, Pearson Education, 2000.
3. Daniel Tabak, Advanced Microprocessors, McGraw Hill, 2001.
4. A.K. Ray & K.M. Bhurchandi, "Advanced Microprocessors & Peripherals, Architecture, Programming & Interfacing", Tata McGraw Hill.

Mapping of Course Outcomes with Programme Outcomes:

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

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



EC15253 ADVANCED MICROPROCESSORS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- study the concepts of architecture and assembly language programming of ARM Processor.
- understand the concepts of 32 bit processor
- know the concepts of pentium processor
- learn the concepts of RISC processor
- know the relevance of motorola processors

UNIT I OVERVIEW OF 16 BIT PROCESSOR 9

Need of advanced microprocessors: 80186 Microprocessor Architecture - Segmented Memory - Addressing Modes -Instruction Set - 80186 Assembly Language Programming - co processor 80187 Data Processor Architectural details - Data types - Floating point Operations – 80187 Instructions

UNIT II INTEL 32-BIT PROCESSOR 9

Architectural details of 80386 Microprocessor - Special registers - Memory management-Operation in protected mode and virtual 80386 mode - Memory paging mechanism -Special instructions of 80386 - Architectural details of 80486 - Special registers - Additional instructions - Comparison of 80386 and 80486 processors

UNIT III HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM 9

Introduction to Pentium Processor - Architectural features - Comparison with the workstations - Branch prediction logic - cache structure. - Special Pentium Registers. Memory management - virtual mode of operation - Comparison with the previous processors. Features of Pentium-II, Pentium-III and Pentium Pro-processors

UNIT IV RISC PROCESSOR 9

RISC Microprocessors – RISC Vs CISC – RISC Properties – DEC Alpha AXP Architecture - Power PC – Architecture - Programming Model – Data Types –Addressing Modes – Instruction Set. Sun SPARC – Architecture – Data Types –Instruction Sets - Features of MIPS, AMD Microprocessors

UNIT V MOTOROLA PROCEESORS 9

Motorola Microprocessors – 68000 Microprocessor – Architecture – Registers –Addressing Modes – Features of 68020 – 68030 – 68040 Microprocessors

TOTAL PERIODS 45

COURSE OUTCOMES

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

- apply the concepts of 16-bit processor
- analyse the concepts of 32-bit processor

- evaluate about PENTIUM processors and CPU cores.
- compare various RISC processors
- evaluate the relevance of motorola processors

TEXT BOOKS

1. Barry B Brey "Intel Microprocessors : 8086/88, 80186/188, 80286, 80386, 80486,Pentium, Pentium – II, Pentium – III and Pentium – IV, Architecture, Programming& Interfacing", Pearson Education, 2003
2. Steve Furber, ARM System on Chip Architecture, Addison –Wesley Professional, 2000. "A Course in Electrical & Electronic Measurements and Instrumentation", DhanpatRai and Co, 2004.

REFERENCES

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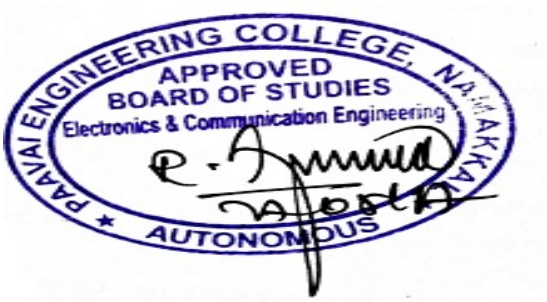
3. Daniel Tabak, Advanced Microprocessors, McGraw Hill, 2001.
4. A.K. Ray & K.M. Bhurchandi, "Advanced Microprocessors & Peripherals, Architecture, Programming & Interfacing", Tata McGraw Hill.

Mapping of Course Outcomes with Programme Outcomes:

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

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



BA15253 TOTAL QUALITY MANAGEMENT 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- describe the basic concepts in quality management, customer orientation and retention.
- facilitate the understanding of quality management principles and process.
- discuss the techniques in six sigma, bench marking and FMEA.
- understand the basic concepts in quality function development and TPM.
- become familiar with quality system, quality auditing and HR practices.

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.

UNIT II TQM PRINCIPLES 9

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I 9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II 9

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) – Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service Return on Investment - Personnel management. Recruitment, selection and training - Technology in Agrisectors

TOTAL PERIODS 45

COURSE OUTCOMES

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

- discuss the basic concepts in quality management, customer orientation and retention

- describe the principles and process of quality management.
- implement the quality control techniques in six sigma, bench marking and FMEA.
- explain the basic concepts in quality function development and TPM.
- understand the elements in quality system, quality auditing and HR practices.

TEXT BOOKS

1. Dale H. Besterfiled, et at., "Total quality Management", Third Edition, Pearson Education Asia, Indian Reprint, 2006.
2. D.R Kiran, "Total quality Management", Butterworth-Heinemann, 2016.

REFERENCES

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
3. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
4. Dennis AuBuchon, Understanding the Concept of Quality, Pronoun, 2017.
5. Donna C. S. Summers, Quality, Pearson, 5th edition, 2009.

Mapping of Course Outcomes with Programme Outcomes:

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

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

EC15351 DIGITAL IMAGE PROCESSING 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- gain knowledge about digital image fundamentals.
- exposed to simple image enhancement techniques.
- familiar with image restoration and segmentation techniques.
- know about wavelets and image compression techniques
- learn to represent image in form of features

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color models.

UNIT II IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering. Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

UNIT III IMAGE RESTORATION AND SEGMENTATION 9

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering .Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation Morphological processing erosion and dilation

UNIT IV WAVELETS AND IMAGE COMPRESSION 9

Wavelets – Sub band coding - Multiresolution expansions - Compression**:** Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

UNIT V IMAGE REPRESENTATION AND RECOGNITION 9

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- explain the digital image fundamentals.

- apply image enhancement techniques.
- use image restoration and segmentation Techniques.
- analyse wavelets and image compression techniques
- represent features of images

TEXT BOOKS

Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.

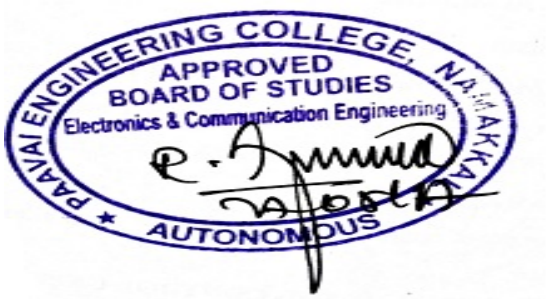
REFERENCES

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata McGraw Hill Pvt. Ltd., 2011
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011. Willliam K Pratt, "Digital Image Processing", John Willey, 2002.
3. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.

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	-	-	-	-	-	3	3	3	3
CO2	3	3	3	-	3	-	-	-	-	-	3	3	3	3
CO3	3	3	3	-	3	-	-	-	-	-	3	3	3	3
CO4	3	3	3	-	3	-	-	-	-	-	3	3	3	3
CO5	3	3	3	-	3	-	-	-	-	-	3	3	3	3



EC15352 COMPUTER ARCHITECTURE 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- make the students understand about performance of computer and various addressing modes
- acquire knowledge about the concept of arithmetic operation in computer design
- familiarize the student about various memory technologies and I/O system
- gain knowledge about the parallelism
- understand the concept of pipelining and control unit

UNIT I OVERVIEW AND INSTRUCTIONS 9

Computing and Computers- Evolution of computer- Eight Ideas – Components of a computer system – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – Format and its types – representing instructions – Logical operations – control operations – Addressing and addressing mode

UNIT II ARITHMETIC OPERATIONS 9

ALU – Fixed point Arithmetic - Addition and subtraction – Multiplication – Division – Floating Point Arithmetic – Subword parallelism.

UNIT III MEMORY AND I/O SYSTEMS 9

Memory hierarchy – Memory technologies – Cache basics – Measuring and improving cache performance – Virtual memory, TLBs – Input/output system, programmed I/O, DMA and interrupts, I/O processors.

UNIT IV PARALLELISM 9

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multiprocessor

UNIT V PROCESSOR AND CONTROL UNIT 9

Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling of Data hazards and Control hazards – Exceptions.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- evaluate about performance of computer and various addressing modes
- analyse the concept of arithmetic operation in computer design
- the student about various memory technologies and I/O system
- acquire knowledge about the parallelism
- expose the student with concept of pipelining and control unit

TEXT BOOKS

1. David A. Patterson and John L. Hennessey, "Computer Organization and Design", Fifth edition, Morgan Kauffman / Elsevier, 2014.
2. John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third edition, 1998.

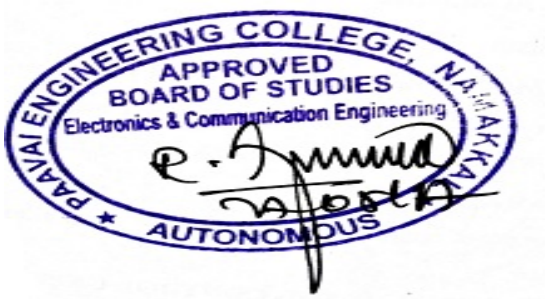
REFERENCES

1. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI edition, McGraw-Hill Inc, 2012.
2. William Stallings "Computer Organization and Architecture", Seventh Edition , Pearson Education, 2006.
3. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.
4. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", first edition, Tata McGraw Hill, New Delhi, 2005 V

Mapping of Course Outcomes with Programme Outcomes:

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

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



EC15353 MULTIMEDIA COMPRESSION TECHNIQUES 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- learn about the various compression techniques for audio signals- video signals and text data.
- gain knowledge about analog and digital video signals and systems
- learn about various video compression techniques
- study the image compression techniques
- acquire the basic concepts of designing audio compression

UNIT I INTRODUCTION OF MULTIMEDIA 9

Special features of Multimedia – Graphics and Image Data Representations –Fundamental Concepts in Text Images-Graphics-Video and Digital Audio – Storage requirements for multimedia applications - Need for Compression- Lossy& Lossless Compression techniques – Overview of source coding- Information theory & source models-vector quantization theory: LGB algorithm– Evaluation techniques – Error analysis and Methodologies

UNIT II TEXT COMPRESSION 9

Compaction techniques – Huffmann coding – Adaptive Huffmann Coding –Arithmatic coding – Shannon- Fanocoding – Dictionary techniques – LZW family algorithms

UNIT III AUDIO COMPRESSION 9

Audio compression techniques -μ- Law and A- Law companding.Frequency domain and filtering -. Predictive techniques – DM- PCM- DPCM: Optimal Predictors and Optimal Quantization- Formant and CELP Vocoders –Application to speech coding – G.722 – Application to audio coding – MPEG audio-progressive encoding foraudio – Silence compression- speech compression techniques

UNIT IV IMAGE COMPRESSION 9

Contour based compression – Transform Coding – JPEG Standard – Sub-band coding algorithms: Design of Filter banks – Wavelet based compression: Implementation using filters – EZW- SPIHT coders – JPEG 2000 standards - JBIG- JBIG2 standards. Basic sub-band coding

UNIT V VIDEO COMPRESSION 9

Video compression techniques and standards – MPEG Video Coding I:MPEG – 1 and 2 – MPEG Video Coding II: MPEG – 4 and 7 – Motion estimation and compensation techniques – H.261 Standard – DVI technology – PLV performance – DVI real time compression – Packet Video

TOTAL PERIODS 45

COURSE OUTCOMES

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

- examine the concept of requirement for memory space reduction .
- develop efficient algorithms for compression.

- compare different multimedia data in digital formats
- comprehend about data compression techniques, image compression techniques like JPEG
- elaborate about video compression techniques like MPEG.

TEXT BOOKS

Khalid Sayood, "Introduction to Data Compression", Morgan Kauffman Harcourt India, 2nd Edition, 2000.

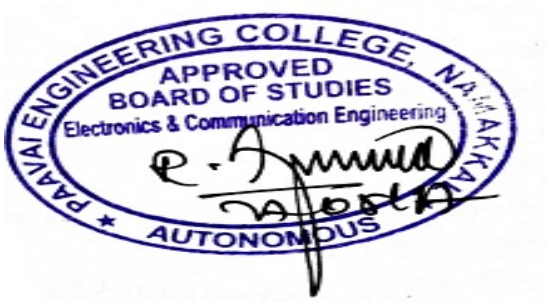
REFERENCES

1. Peter Symes, "Digital Video Compression", McGraw Hill Pub., 2004.
2. Mark Nelson, "Data compression", BPB Publishers, New Delhi,1998.
3. Mark S.Drew, Ze-Nian Li, "Fundamentals of Multimedia" PHI, 1st Edition, 2003
4. Yun A Shi, Huifang Sun, "Image & Video compression for Multimedia Engineering, Fundamentals, Algorithms & Standards, CRC Press, 2003.

Mapping of Course Outcomes with Programme Outcomes:

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

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



EC15354 **TELECOMMUNICATION SYSTEM MODELLING AND SIMULATION** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- make the student understand about Simulation methodology and modeling of communication networks
- apply the concept of layers in wireless network
- familiarize the student about the modeling of channels and mobility
- acquire knowledge about the network topology and modeling of higher level layers
- expose the student with application and performance of wireless system by simulation

UNIT I INTRODUCTION TO MODELING AND SIMULATION 9

Introduction, Discrete-event Simulation, Modeling for Computer Simulation, Tools and methods for Network Simulation, The Simulation Platform, Simulation Framework, Tools and Modeling Approaches for Simulating Hardware

UNIT II LOWER LAYER AND LINK LAYER WIRELESS MODELING 9

Physical Layer Modeling, Description of the Main Components of the PHY Layer, Physical Layer Modeling for Network Simulations, Link Layer Modeling, Medium Access Control (MAC) Protocols, Logical Link Control, Forward Error Detection and Correction, Backward Error Detection and Correction, Queuing and Processing Delay

UNIT III CHANNEL MODELING AND MOBILITY MODELING 9

Channel Modeling: The Physics of Radiation, Classification of Propagation Models, Deterministic Approaches by Classical Field Theory, Deterministic Geometric Optical Approaches, Empirical Path Loss Approaches. Mobility modeling: Mobility Models and category, Random Walk Model, Random Waypoint Model, Random Direction Model, Gauss Markov Model, Manhattan Model, Selection of Appropriate Mobility Models.

UNIT IV HIGHER LAYER MODELING AND NETWORKTOPOLOGY 9

Higher Layer Modeling: Modeling the Network Layer and Routing Protocols, Components of a Routing Protocol, Virtual Routing on Overlays, Modeling Transport Layer Protocols, Modeling Application Traffic. Modeling the Network Topology : Common Topology Models, Geometric Random Graphs–The Waxman Model, Hierarchical Topologies, Preferential Linking–The Barabási-Albert Model , Modeling the Internet.

UNIT V MONTE CARLO SIMULATION 9

Fundamental concepts, Application to communication systems, Monte Carlo integration, Semi analytic techniques, Case study: Performance estimation of a wireless system.

TOTAL PERIODS 45

COURSE OUTCOMES

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

- understand about Simulation methodology and modeling of communication network
- apply the concept of layers in wireless network
- familiarize about the modeling of channels and mobility
- acquire knowledge about the network topology and modeling of higher level layers
- expose the application and performance of wireless system by simulation

TEXT BOOKS

M.C.Jeruchim, P.Balaban and K. Sam Shanmugam, "Simulation of Communication Systems: Modeling, Methodology and Techniques", Plenum Press, New York, 2001.

REFERENCES

1. K.Wehrie. Gunes, J.Gross, "Modeling and Tools for Network simulation", Springer, 2010.
2. Irene Karzela, "Modeling and Simulating Communications Networks", Prentice Hall India,1998
3. William.H.Tranter, K. Sam Shanmugam, Theodore. S. Rappaport, Kurt L. Kosbar, "Principles of Communication Systems Simulation", Pearson Education (Singapore)Pvt. Ltd, 2004.
4. Nejat;Bragg, Arnold, "Recent Advances in Modeling and Simulation Tools for Communication Networks and Services", Springer, 2007

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

COs	Programme Outcomes(POs)															
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	3	2	2	-	3	-	-	-	-	2	-	3	3	3	3
CO2	3	3	2	2	-	-	-	-	-	-	2	-	3	3	3	3
CO3	3	3	2	2	-	3	-	-	-	-	2	-	3	3	3	3
CO4	3	3	3	1	-	-	-	-	-	-	2	-	3	3	3	3
CO5	3	3	3	1	-	3	-	-	-	-	2	-	3	3	3	3