SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF ENGINEERING & TECHNOLOGY

ELECTRONICS & TELECOMMUNICATION ENGINEERING

Syllabus for

B.E. (E & TC Engineering) w.e.f. Academic Year 2015-16

SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF ENGINEERING & TECHNOLOGY
Electronics & Telecommunication Engineering

Program Educational Objectives and Outcomes

Program Educational Objectives (PEO'S)

1 To prepare students to give good theoretical background with sound practical knowledge, enable them to analyze and solve Electronics and communication Engineering problems by applying basic principles of mathematics, science, and engineering and using modern tools and techniques.

2 To make students to test hardware components and software for offering solution to real life situations.

3 To inculcate students to be sensitive to ethical, societal and environmental issues while pursuing their professional duties.

4 To build strong fundamental knowledge amongst students to pursue higher education, and to enhance research and continue professional development in Electronics, communication and IT industries with attitude for lifelong learning.

5 To nurture students with technical and communication skills in order to be able to function on multidisciplinary fields and make them aware of contemporary issues at national and international levels.

6 To develop students for team working and managerial skills leading to entrepreneurship and leadership.

Program Outcomes (PO's)

1. An ability to apply knowledge of mathematics, science, and engineering,
2. An ability to design and conduct experiments, as well as to analyze and interpret data,
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
4. An ability to function on multidisciplinary teams,
5. An ability to identify, formulate, and solve engineering problems,
6. An understanding of professional and ethical responsibility,
7. An ability to communicate effectively,
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context,
9. A recognition of the need for, and an ability to engage in life-long learning,
10. A knowledge of contemporary issues, and
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

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FACULTY OF ENGINEERING & TECHNOLOGY

STRUCTURE OF B.E (Electronics & Telecommunication Engineering)

W.E.F 2015-16

B. E. (Electronics & Telecommunication Engineering) Semester- I

Sr. No.	Subject	Teaching Scheme				Examination Scheme				
		L	Tut	P	Total	Th.	TW	POE	OE	Total
1	Computer Communication Network	4	--	2	6	100	25	50	--	175
2	VLSI Design	4	--	2	6	100	25	50	--	175
3	Satellite Communication	3	1	--	4	100	25	--	--	125
4	Coding Theory	3	1	--	4	100	25	--	--	125
5	Elective – I	4	--	2	6	100	25	--	--	125
6	Seminar & Project	--	--	4	4	--	25	--	50	75
7	Vocational Training	--	--	--	--	--	25	--	--	25
	Total	**18**	**2**	**10**	**30**	**500**	**175**	**100**	**50**	**825**

Elective – I Advanced Telecommunication Network
Image Processing
Advance DSP.

B. E. (Electronics & Telecommunication Engineering) Semester- II

Sr. No.	Subject	Teaching Scheme				Examination Scheme				
		L	Tut	P	Total	Th.	TW	POE	OE	Total
1	Broadband Communication	3	1	--	4	100	25	--	25	150
2	Multimedia Communication Techniques	4	--	2	6	100	25	--	50	175
3	Embedded Systems	4	--	2	6	100	25	--	50	175
4	Elective – II	4	--	2	6	100	25	--	--	125
5	Project	--	--	8	8	--	100	100	--	200
	Total	**15**	**1**	**14**	**30**	**400**	**200**	**100**	**125**	**825**

Elective – II Wireless Sensor Network
Pattern Recognition
DSP Processors & Application

Note:

- Minimum strength of the students for Elective be 15.
- Term work assessment shall be a continuous process based on student's performance in class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.

- The batch size for the practical's/tutorials be of 15 students. On forming the batches, if the strength of remaining students exceeds 7 students, then a new batch be formed. For project the group shall be of three students.

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B.E.(Electronics and Telecommunication Engineering) Part-I

COMPUTER COMMUNICATION NETWORK

Teaching Scheme:
Theory:4 Hrs/Week
Practical :2 Hr/Week

Examination Scheme:
Theory:100 Marks
Term-Work:25 Marks
Practical Oral Exam:50Marks

- **Course Objectives**
  1. To acquire knowledge of the computer network, its architecture and operation
  2. To understand layered network communication model in detail.
  3. To make students familiar with network devices and standards.
  4. To learn about application protocols related to networks and Internet.

- **Course Outcomes:**
  After completion of this course, student will be able to
  1. Describe computer communication networks.
  2. Differentiate the various types of network configurations.
  3. Identify and describe network devices and standards.
  4. Explain local area networks, internet, protocols and applications.

Section – I

UNIT 1: Data Communication **[08 Hrs]**

Network- Need, Layers, Layer communication, OSI model, RS 232, Network topologies

UNIT 2: Data Link Layer **[10Hrs]**

Framing, Error detection and error correction, Flow control methods- Stop and wait protocol, sliding window protocol, MAC – Collision oriented and collision based protocols, HDLC.

UNIT 3: Transport Layer **[08 Hrs]**

TCP/IP, TCP header format, UDP, IP header, IP V4, IP addressing, Subneting, Masking, TCP congestion control

Section – II

UNIT 4: LAN Standards **[06 Hrs]**

IEEE 802.3- Performance of IEEE 802 LAN, Megabit LAN, Gigabit LAN, IEEE 802.4, IEEE802.5, DHCP, ARP, RARP

UNIT 5: Network Layer **[10 Hrs]**

Routing- Principle of optimality, shortest path routing, flow based routing, distance vector routing, link state routing, ICMP

UNIT 6: Network Devices **[04 Hrs]**

MODEM, Repeaters, Switches, Bridges, Routers, Gateways

UNIT 7: Application Protocols **[06 Hrs]**

FTP, DNS, TELNET, SMTP, E-mail, IP V6

- **Term Work**

  Term work shall be based on minimum eight experiments on below mentioned topics-

  1. RS 232 based lab sessions-
     a. Character transfer using half duplex and Full duplex mode of operation (using bios com function)
     b. File transfer using serial port
  2. Flow control- Stop and Wait protocol
  3. Implementation of Scrambler and descrambler
  4. Error correction mechanism- Hamming Code
  5. Error detection mechanism- CRC
  6. Network analyzer (Protocol analyzer)-wire shark
  7. Internet application protocol-FTP and DNS

- **Text Books**

  1. Data communication- B.A. Forouzan 4th Edition Tata Mc Graw hill Publication
  2. TCP/IP protocol suit- B.A. Forouzan 4th Edition Tata Mc Graw hill Publication
  3. Computer networks- Andrew S. Tanenbaum

- **Reference Books.**
  1. Internetworking TCP/IP Principal, Protocol and Architecture -Douglas Comer- Addision -Wesley
  2. TCP/IP Illustrated, The Protocols – W. Richard Slevens, G.Gabrani –PE pub.
  3. Data and computer communication – William Stallings. - PE pub.

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B.E.(Electronics and Telecommunication Engineering) Part-I

VLSI DESIGN

Teaching Scheme:
Theory:4 Hrs/Week
Practical :2 Hr/Week

Examination Scheme:
Theory:100 Marks
Term-Work:25 Marks
Practical Oral Exam:50Marks

- **Course Objectives:**
  1. To make student analyze CMOS logic design.
  2. To make student learn EDA Tools for VHDL programming.
  3. To enable student to design and verify VHDL modules for combinational and sequential logic circuits.
  4. To make student verify VHDL modules using CPLD or FPGA kits.

- **Course Outcomes:**

  After completion of this course, student will be able to
  1. Use EDA Tools for logic system design.
  2. Design, implement and analyze combinational and sequential logic circuits.
  3. Design combinational logic using CMOS logic.
  4. Implement real time applications on commercially available devices.

Section – I

Unit 1 : CMOS Design **[07Hrs]**

CMOS Logic, DC characteristic of CMOS inverter, Static load MOS inverter, switching characteristics, Power dissipation, CMOS logic gate design.

Unit 2: Introduction to EDA tool and VHDL programming **[10Hrs]**

Review of logic design and fundamentals, Introduction to VHDL, Variables, Signals, Constants, Arrays, VHDL procedures, packages, libraries, attributes, delays, operator overloading, generics, generate statement, IEEE standard logic, case statement.

Unit 3: VHDL Model for combinational and sequential logic **[07Hrs]**

4-bit binary adder, Array multiplier, divider, multiplexer, comparator, decoder, Latches, Flip-flops, counters (synchronous and asynchronous),shift registers, static RAM.

Section – II

Unit 4: State machines and its applications [09Hrs]

State machine using Moore and Mealy model, VHDL model for Traffic light controller, sequence detector, coffee vending machine using state machine, multiplier using ADD and SHIFT method.

Unit 5: Architecture of commercial devices [08Hrs]

CPLD Architecture, Xilinx XC9500,Altera Max7000, FPGA organization and architecture, Altera Flex 10k,Introduction to System on Chip architecture.

Unit 6: Testing of Logic Circuits [07Hrs]

Testing combinational and sequential logic, Boundary scan, Built In Self test, Test bench for combinational design for binary adder, comparator, encoder, decoder, multiplexer and demultiplexer.

Term Work:

Term work shall be based on minimum ten programs based on above curriculum using suitable EDA tools. A suggestive list is as below-

1. Design of half adder and full adder using VHDL and schematic editor
2. Design of 4 bit adder and carry look ahead adder using structural style modeling.
3. Design of code converters and comparators
4. Design of encoder and decoder
5. Design of 8:1 multiplexer using VHDL
6. Design of flip flops
7. Design of universal shift register
8. Design of asynchronous and synchronous counters
9. Design of sequence detector using state machine
10. Design of Traffic light controller using state machine editor
11. Frequency multipliers and dividers
12. Design of ALU
13. Design of RAM with read write control
14. Writing test bench for adder , encoder

Text books:

1. Fundamentals of Digital logic Design with VHDL, Brown,Vranesic – McGraw-Hill(Second edition).
2. Digital Systems Design using VHDL, Charles H. Roth, Lizy Kurian John- Cengage Learning, Second Edition
3. Circuit Design using VHDL, Volnei A. Pedroni, PHI

Reference books:

1. VHDL Primer J.Bhasker – Prentice Hall
2. Principles of CMOS VLSI Design, Neil H.E.Weste, Kamran Eshraghian - Pearson
3. Essentials of VLSI circuits and Systems, Kamran Eshraghian, DuglusPucknell –PHI
4. Digital Logic Design and VHDL- Phadake –Wiley India
5. Datasheets of CPLDs and FPGAs.

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B.E.(Electronics and Telecommunication Engineering) Part-I

SATELLITE COMMUNICATION

Teaching Scheme:
Theory:3Hrs/Week
Tutorial :1Hr/Week

Examination Scheme:
Theory:100 Marks
Term-Work:25 Marks

- **Course Objectives: -**
  1. To introduce to student principles of orbital mechanism and satellite subsystems.
  2. To make student understand the satellite link budget design.
  3. To make student comprehend concept of Earth Station, GPS system.

- **Course Outcomes: -**
  After completion of this course, student –
  1. Can explain basics of satellite communication
  2. Is able to state various aspects related to satellite system.
  3. Is able to solve problems related to orbital mechanism, link budget design.

Section – I

Unit 1: Introduction to satellite communication, Orbit Mechanism and Launchers- [07hrs]
Introduction – History of satellite communication, Development of satellite communication, frequency allocation.
Orbital Mechanism- Introduction, basic principle, Kepler's laws, Orbiting parameters, types of satellite orbit-Orientation of critical plane, eccentricity, distance from earth, sun synchronous orbit.
Launchers- Launch vehicle, Satellite launch vehicle (SLV), Augmented satellite launch vehicle (ASLV), Polar SLV (PSLV), Geo-Satellite launch vehicle (GSLV)

Unit 2: Satellite subsystems- [05hrs]
Satellite subsystems, attitude and orbit control system (AOCS), Telemetry, Tracking command and monitoring, power system, communication subsystem, antenna subsystem, equipment reliability and space qualification.

Unit 3: Satellite Link Design- [08 hrs]
Introduction, basic transmission theory, system noise temperature and G/T Ratio, design of downlinks, satellite systems using small earth stations, uplink design, design of specified C/N-Combining C/N and C/I values in satellite links, system design examples.

Section – II

Unit 4: Earth station- **[06 hrs]**

Introduction, Types of earth stations- FSS, BSS, MSS, single frequency station, Gateway station, earth station architecture, earth station design consideration, performance parameters, optimization, earth station testing, R.F. equipment for earth station.

Unit 5: Low Earth Orbit and Non-Geostationary Satellite systems- **[05 hrs]**

Introduction, orbit considerations, coverage and frequency consideration, delay and throughput consideration, operational NGSO constellation design-Irridium, Teledesic

Unit-6: Satellite Navigation and Global Positioning system (GPS)- **[07 hrs]**

Introduction, radio and satellite navigation, GPS position location principles, GPS receivers and codes, satellite signal acquisition, VSAT.

Home satellite TV, Digital DBS TV, satellite radio broadcasting.

Term Work

Term work shall be based on minimum eight tutorials as below-

1. Four Tutorials based on problems from unit 1, 2, 3
2. One Tutorial based on Indian Satellite launchers-SLV, ASLV, PSLV, Mangalyaan (Mars Orbit Mission-MOM)
3. One tutorial based on DBB and DBS TV
4. One tutorial based on GPS
5. Two tutorial based on Home satellite TV, Digital DBS TV, satellite radio broadcasting

Note – Students are encouraged to visit satellite earth station / TV Relay / Radio station to understand working of satellite communication

Text Books-

1. Satellite communication-Timothy Pratt, Charles Bostian, Jeremy Allnutt- John Wiley & Sons (2nd Edition)
2. Satellite Communication-Anil K. Maini, Varsha Agrawal- Wiley India PVT Ltd.
3. Satellite Communication- Dennis Roody- McGraw Hill.

Reference Books-

1. Satellite communication- Manjit Mitra- PHI Learning PVT Ltd.
2. Satellite communication- systems- Gerard Maral, Michel Bousquet - John Wiley & Sons
3. Satellite Communication- K.N. Raja Rao- Prentice Hall of india.

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B.E.(Electronics and Telecommunication Engineering) Part-I

CODING THEORY

Teaching Scheme:
Theory:3Hrs/Week
Tutorial: :1Hr/Week

Examination Scheme:
Theory:100 Marks
Term-Work:25 Marks

- **Course Objectives:**
  1. To reinforce student's concepts of probability and random signal theory
  2. To introduce to student concepts of coding techniques of linear block code, cyclic codes, Turbo codes and Convolution codes
  3. To make student able to design and implement coding techniques of linear block code, cyclic codes, Turbo codes, Convolution codes.

- **Course Outcomes:**
  After completion of this course, student will be able to
  1. Solve problems in coding techniques
  2. Analyze and design coder and decoder for linear block code, cyclic codes.

Section – I

Unit 1 : Probability and Random Variables- [09 hrs]

Probability: Introduction to probability, set theory, axiomatic approach to theory of probability, conditional probability and Bayes theorem. Random Variables: Concepts of random variables, cumulative distribution function, probability distribution function, Joint cumulative distribution and joint density function of two random variables.

Unit 2 : Linear Block Codes- [06 hrs]

Introduction to linear block code, linear block code examples, generator matrix, systematic linear block codes, Parity-check matrix, Syndrome testing, Error correction, Decoder implementation

Unit 3 : Cyclic Codes - [07 hrs]

Algebraic structure of cyclic codes, Binary cyclic code properties, Encoding systematic form, circuit for dividing polynomials, Systematic encoding with an (n-k) stage shift Register, Error detection with an (n-k) stage shift register

Section – II

Unit 4 : Convolution Encoding - [08 hrs]

Convolution Encoding, Convolution encoder representation: Connection Representation, State representation and the state diagram, tree diagram, Trellis diagram, Distance Properties of convolution Codes, Systemic and Nonsystematic Convolution Codes, Catastrophic Error propagation in Convolution Codes

Unit 5 : Convolution Decoding - [08 hrs]

Formulation of the Convolution decoding problem : Maximum likelihood decoding, Channel models – Hard versus Soft decisions, The Viterbi Convolution decoding, An example of Viterbi Convolution decoding, Decoder Implementation, Path memory and synchronization.

Unit 6 : Turbo Codes: [06 hrs]

Turbo code concepts, Log-Likelihood algebra, Product code example, The MAP decoding algorithm, MAP decoding example.

Term Work:

Term work shall be based on minimum eight tutorials covering above curriculum. It is highly desirable to include tutorials based on numerical examples and coding (programming) through suitable software tool.

Text Books:

1. Introduction to Probability & Random Process by Gorge I. Aunin & V. Chandrasekar.
2. Digital Communication Fundamentals and Applications 2nd edition by Bernard Sklar Pearson].
3. Digital Communication - Sam Shanmugham - John wiley & Sons

Reference Books:

1. Introduction to Probability Models -Sheldon M. Ross –Pearson, Sixth Edition
2. Digital Communication - Siman Haykin - Wiley
3. Modern Digital &Analog Communication System –B.P. Lathi – Oxford
4. Error Control coding–Shu Lin-Pearson ,2nd edition

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B.E.(Electronics and Telecommunication Engineering) Part-I

Elective-I

ADVANCED TELECOMMUNICATION NETWORK

Teaching Scheme:
Theory:4 Hrs/Week
Practical :2 Hr/Week

Examination Scheme:
Theory:100 Marks
Term-Work:25 Marks

- **Course Objectives**

1. To acquire knowledge of the Telecommunication network, its architecture and operation
2. To describe different standards of wireless Network Technology.
3. To make students familiar with different Advanced Telecommunication Networks.
4. To learn about applications related to different networks.

- **Course Outcomes:**

After completion of this course, student will be able to

1. Identify and describe different standards of wireless Network Technology.
2. Differentiate the various network Architecture.
3. Explain applications of Telecommunication Network.
4. Understand different implementation scenarios and issues.

Section – I

UNIT 1 : Emerging wireless Network Technology [8 Hrs]

IEEE 802.11 WLAN, ETSI HIPER LAN Technology, IEEE802.15 WPAN Technology, IEEE 802.16 WMAN Technology, Wireless sensor network, RFID Technology

UNIT 2: Next Generation Mobile Networks [8 Hrs]

LTE, Wimax advanced, Fixed mobile convergence(FMC) in NGN, IP multimedia subsystem (IMS) for NGN, migration of PSTN network in NGN, Transition of IP network to NGN.

UNIT 3: Advanced Optical Network [8 Hrs]

SONET and SDH, Types of optical network topologies, metro optical networking, Generalized MPLS use in optical network, Architecture of IP and MPLS based optical Transport network

Section-II

UNIT 4 : **Cognitive Radio Network** **[10 Hrs]**

Making radio self aware, the cognitive cycle, organization of cognitive task, structuring knowledge for cognitive task, Enabling location and environment awareness in cognitive radios- concepts, architecture, Design consideration

UNIT 5 : Cooperative Communications and Networks **[10 Hrs]**

Introduction to cooperative communication, Basic techniques, MIMO and smart Antennas, Benefit and Drawbacks, Applications of Cooperative Communications, Implementation scenarios and issues, Introduction to advanced issues in Cooperative Communication

UNIT 6: Advanced Telecommunication Network in Tele-Health care **[4 Hrs]**

The special requirements of Tele-healthcare, Cognitive Radio and flexible spectrum usage for Tele-healthcare, Cooperative Communications for Tele-healthcare

Term works:
Term work should consist at least eight experiments based on above syllabus.

Text Books:

1. Mobile and Personal communication system and services - Raj Pandya- PHI publication
2. Wireless Communication -T L Signal -Tata McGraw Hill publication
3. Optical Network Third Generation Transport System- Uyless Black - Prentice Hall Publication
4. Optical Network- P E Green - Prentice Hall publication

Reference Books:

1. Next Generation Wireless System and Networks - Hsiao-Hwa Chen, Mohsen Guizani - Wiley publication
2. Cognitive Radio Network -Kwang-Cheng Chen and Ramjee Prasad - John Wiley and sons Ltd
3. Cognitive Radio Communications and Networks - S Alexander M. Wyglinski Mazier Nekovee, Thomas Hou - Principles and Practice".
4. Cooperative Communication and Networking - K J Rayliu, A K Sadek,Weifeng Su and Andres Kwasinski- Cambridge University Press, 2009

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B.E.(Electronics and Telecommunication Engineering) Part-I

Elective-I

IMAGE PROCESSING

Teaching Scheme:
Theory:4 Hrs/Week
Practical :2 Hr/Week

Examination Scheme:
Theory:100 Marks
TermWork:25 Marks

- **Course Objectives:**
  1. To introduce to student concept of image & color fundamental concept.
  2. To introduce to student fundamentals of Digital Image Processing in spatial and transform domain.
  3. To introduce to student time and frequency domain techniques for image enhancement.
  4. To make student realize need of image transformation & image compression techniques.
  5. To make student understand different basic image analysis techniques & application areas of Digital Image Processing.

- **Course Outcomes:**

  After studying this course student will be able to
  1. Describe applications of digital image processing.
  2. Apply mathematical tools for processing images.
  3. Enhance images using time and frequency domain enhancement techniques
  4. Analyze the images
  5. Describe various image compression techniques

Section – I

Unit 1 : Digital Image Fundamentals: [09 hrs]

Elements of visual perception, Image acquisition and sensing, Image sampling & Quantization, Some basic relationships between pixels, Neighborhood concepts, adjacency and distance measures, color fundamentals, color models, pseudo color image processing.

Unit 2 : Image Enhancement And Restoration: [10 hrs]

Basic grey level transformations, histogram processing, enhancement using arithmetic and logic operations, spatial filtering – smoothing and sharpening filters. Smoothing and sharpening in frequency domain, Model of Image degradation / restoration process, Noise models, Restoration in the presence of Noise – spatial filtering.

Unit 3: Morphological Image Processing : [05 hrs]

Dilation & erosion, opening & closing operations, basic morphological operations such as region filling, thinning, thickening, skeletons, pruning for binary and gray scale images.

Section – II

Unit 4: Image Segmentation: [08 hrs]

Detection of discontinuities, edge linking and boundary detection, thresholding, region based segmentation, use of watershed algorithm, image representation- chain codes, boundary descriptors & regional descriptors

Unit 5: Image Transforms & Compression: [10 hrs]

Coding, interpixel and psychovisual image redundancy, fidelity criteria, Error free compression 2-D Discrete Fourier Transform, Discrete Cosine Transform – its application in Baseline JPEG, sub band coding, Haar Transform – it's application as a Wavelet, multi resolution expansions, 1-D Wavelet Transform, Fast Wavelet Transform;

Unit 6: Image Processing Applications: [06 hrs]

Applications in fingerprinting, Face detection, Medical applications such as tumor detection, Remote sensing.

Term Work:

Term work shall consist of minimum eight experiments out of the following, using suitable software tool

1. Reading, displaying and Writing images.
2. Finding distance between two pixels using Euclidean, City Block, Chess
3. Board distance measures.
4. Conversion of Image file formats.
5. Conversion of Color models.
6. Finding DFT, FFT, DCT coefficients of the image.
7. Applying Gray level transformations to the image.
8. Finding Histogram of the image and enhancing the image using Histogram Equalization.
9. Smoothing and Sharpening of the image using Spatial domain filtering.
10. Smoothing and Sharpening of the image using frequency domain filtering.
11. Addition of the noise to the image and removal of noise using different filters.
12. Dilation and erosion of the image.
13. Image compression using any one technique.
14. Edge detection using any one operator.
15. Boundary extraction.
16. Implementation of Segmentation.

TEXT BOOKS:

1. Gonzalez, Woods, 'Digital Image Processing' – PHI , 2nd edition
2. Milan Sonka 'Image Processing, Analysis & Machine Vision' Thomson Publication.

REFERENCE BOOKS:-

1..Digital Image Processing- Pratt W.K -John Wiley, 2001
2. Fundamentals of Digital Image Processing- Jain A.K.-PHI, 1997
3. Digital Image Processing and Analysis- B. Chandra & D.D. Majumdar- PHI pub., First Edition

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B.E.(Electronics and Telecommunication Engineering) Part-I

Elective -I

ADVANCE DSP

Teaching Scheme:
Theory: 4Hrs/Week
Practical :2 Hr/Week

Examination Scheme:
Theory:100 Marks
Term-Work:25 Marks

- **Course Objectives:**

1. To make student realize need of advanced techniques in DSP
2. To introduce to student wavelet transform
3. To make student understand multi-rate digital signal processing fundamentals
4. To make student able to design adaptive filters
5. To make student understand different methods for spectrum estimation
6. To introduce to student architecture of DSP processors

- **Course Outcomes:**

Students will be able to

1. Apply basics of DSP and wavelet transform
2. Design and implementation of practical sampling convertors
3. Analyze adaptive filters
4. Use types of spectrum estimation

Section – I

Unit 1: An overview of DSP **[04 hrs]**

Review of DSP systems, DFT, FFT and Digital Filters, Decimation and Interpolation.

- *Numerical Problems based on this unit are not expected*

Unit 2: Wavelet Transform **[10 hrs]**

Overview and notation, filter bank (low pass and high pass), scaling function and wavelets, wavelet transform by multiresolution, applications

Unit 3 : Multi-rate digital signal processing **[10 hrs]**

Introduction, concepts of multi-rate signal processing, design of practical sampling rate converter, software implementation of sampling rate convertors-decimators, interpolators, application and examples.

Section – II

Unit 4: Adaptive Digital filters [10 hrs]

Concepts of adaptive filtering, Basic Wiener filter theory, the basic LMS adaptive algorithm, Recursive least squares algorithm, Applications

Unit 5: Spectrum estimation and analysis [10 hrs]

Introduction, principles of spectrum estimation, traditional methods, autoregressive spectrum estimation, comparison of estimation methods, application and examples

Unit 6: General and Special Purpose digital signal processors [4 hrs]

Introduction, Computer architecture for signal processing, general purpose digital signal processors

Term Work:

Term work shall be based on minimum eight experiments covering above curriculum.

Note : It is highly desirable to include minimum two experiments on digital signal processors. Other experiments may include simulation using suitable software tool.

Text Books:

1. Digital Signal Processing, Principals, Algorithms and Applications-John G. Proakis and D G Manolakis, Prentice Hall
2. Wavelet and Filter Banks -Gilbert Strang and Truong Nguyen by Wellesley-Cambridge Press
3. Digital Signal Processing A Practical Approach-2nd edition Emmanuel Ifeachor and Barrie W.Jervis, Prentice Hall

Reference Books

1. DSP Processor Fundamentals, Architectures & Features – Lapsley etal. S. Chand & Co, 2000.
2. Digital Signal Processin - S.K. Mitra- Tata McGraw-Hill Publication, 2001

Solapur University, Solapur

B.E.(Electronics and Telecommunication Engineering) Part-II

BROAD BAND COMMUNICATION

Teaching Scheme:
Theory:3Hrs/Week
Tutorial :1Hr/Week

Examination Scheme:
Theory:100 Marks
Term-Work:25 Marks
Oral Exam:25Marks

- **Course Objectives:**
  1. To introduce to student concept of ISDN and BISDN.
  2. To make student understand services and protocol of ISDN and BISDN
  3. To introduce to student ATM and switching techniques.

- **Course Outcome**:
  Student will be able to
  1. Explain the concept of ISDN ,BISDN and ATM
  2. Distinguish between pros and cons of ISDN and BISDN services.

Section – I

Unit-1 : X.25 and Frame relay **[06 hrs]**

Switching techniques,X.25, Frame relay, X.25 v/s Frame relaying, Frame mode protocol architecture, Frame relay and Frame switching, Frame mode call control, Call control protocol, DLCI, Bearer capability, Link layer core parameters, LAPF.

Unit-2 : ISDN overview **[06 hrs]**

ISDN – Integration of Transmission and Switching, Analog and Digital switching, Principles of ISDN, User interface, Architecture, ISDN standards, I-series recommendations. ISDN services.

Unit-3 : ISDN Interface and Functions **[08 hrs]**

Transmission structure, User network interface configurations, ISDN protocol architecture, ISDN connections, Addressing, Interworking,

Section – II

Unit-4 : B-ISDN Architecture and Services **[08 hrs]**

Conversational, Messaging, Retrieval, Distribution, Business and Residential requirements. B-ISDN functional architecture, user network interface, transmission structure**.**ATM protocol architecture, Physical layer, ATM layer, ATMadaptation layer, SONET /SDH

Unit- 5 : ATM – Overview **[06 hrs]**

Virtual channels, Virtual paths, VP and VC switching, ATM cells, Header format, Generic flow control, Header error control, Transmission of ATM cells, Adaptation layer, AAL services and protocols, ATM service categories, ATM Traffic related Attributes QOS.

Unit- 6 : ATM switching **[06 hrs]**

ATM switching building blocks, ATM cell processing in a switch, Matrix type switch, Input, Output buffering, Central buffering, Performance aspects of buffering switching networks.

Note: Term work should consist of minimum 8 tutorials based on above syllabus.

Text Books:

1. ISDN and Broadband ISDN with Frame Relay and ATM --William Satllings –PHI pub. 4th edition

Reference Books:

1. Broadband Communications Balajikumar, Mac-Graw Hill
2. Broadband Bible - Wiley India Publication

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B.E.(Electronics and Telecommunication Engineering) Part-II

MULTIMEDIA COMMUNICATION TECHNIQUES

Teaching Scheme:
Theory:4 Hrs/Week
Practical :2 Hr/Week

Examination Scheme:
Theory:100 Marks
Term-Work:25 Marks
Oral Exam: 50 Marks

Course Objectives:

1. To understand concepts of disc recording and reproduction
2. To know the components of Color Television Transmitter and Receiver.
3. To study the basics of multimedia
4. To develop ability to analyze various video compression techniques such as MPEG.

Course Outcomes:

1.Student will understand the concept of disc.
2. Student will become familiar with the components of colour TV.
3. Student will develop the ability to analyze the applications of Multimedia and identify various communication modes and media types used in Multimedia.
4. Student will gain the ability to apply engineering tools necessary for engineering practice.

Section- I

Unit 1 : Overview of Recording [5 Hrs]

Principle of disc recording and reproduction, magnetic recording and reproduction, Types of optical recording, Optical Recording on Disc, Playback Process, Compact Disc, Comparison of Compact and Conventional Discs

Unit 2 : Basics of Television [4 Hrs]

Introduction to video systems, scanning , Video signal, video bandwidth, Composite video signal for monochrome TV, VSB transmission and reception (CCIR-B standards), composite colour signals, TV transmitter block diagrams**.**

Unit 3 : Composite Colour Signal [5 Hrs]

Colour spectrum, compatibility, bandwidth, colour TV signals, luminance signal, chrominance signal, recombination to natural colour voltages, interleaving process, colour subcarrier frequency, introduction to NTSC,SECAM and PAL colour TV systems

Unit 4 : Colour TV receivers [6 Hrs]

Antenna, RF tuner, AFT, Video IF amplifier, video detector ,sound section, colour burst circuit, AGC amplifier, vertical deflection system, horizontal deflection system, EHT

Unit 5 : Television Types [**4 Hrs]**

Introduction to digital television, LCD, LED**,** High definition TV, satellite TV, cable TV, Remote control, DVD, DTH

Section II

Unit 6 : Fundamentals of Multimedia Communication [8 Hrs]

Introduction, Elements of multimedia system, Need of multimedia, multimedia information representation, multimedia application: Audio applications, Video applications, interpersonal communications, interactive applications over internet, entertainment applications.

Unit 7 : Multimedia Information Representation [7 Hrs]

Media types, communication modes, multipoint conferencing: centralized, decentralized and hybrid modes, network QoS, basic digital principles for multimedia, Network types, multimedia networks: telephone networks, data networks, broadband multiservice networks,

Unit 8 : Audio & Video Compression: [9 Hrs]

Introduction to audio compression, PCM Speech, CD quality audio, synthesized audio, MIDI, Introduction to Video compression: Broadcast TV, digital video: 4:2:2 format, 4:2:0 format, HDTV format, Video compression techniques: Introduction to MPEG and Brief overview of MPEG standards-MPEG-1, MPEG-2, and MPEG-4.

Term Work: Term work shall consist of any eight experiments out of the following

List of suggested Experiments:

1. Measurement of speed for 33 r.p.m. and 45 r.p.m. record disc playback system
2. Determination of max recording frequency and tape speed for tape reproduction system.
3. Observation and measurements of waveforms at outputs of various internal stages of Monochrome TV receiver
4. Measurement duty cycle for 5 volt and 50 KHz in Switched mode power supply.
5. Observation and measurements of waveforms at outputs of various internal stages of colour TV system.
6. Observation and working of Television transmission (CCTV).
7. Analysis and observation of Composite video signal.
8. Observation of amplitude and frequency of various colour bands of colour video composite signal.
9. Observation of different colour combination of Television receiver
10. Multimedia: working of DVD player
11. Audio / Speech compression techniques.(use appropriate software tool)

12. Video processing / compression techniques such as MPEG etc. (use appropriate software tool)

Note: Students, as a part of their term work, should visit Dordarshan relay centre and submit a report of visit.

Text books:

1. Colour Television Theory and Practice- R. R. Gulati (New Age International Publishers) *(for chapter 1-5)*
2. Television and Video Engineering- A. M. Dhake *(for chapter 1-5)*
3. Multimedia Communications: Applications, Networks, Protocols, and Standards – Fred Halsall, Pearson Education, Second Indian reprint 2002. *(for chapter 6-8)*

Reference books:

1. Audio and Video Engineering Systems-R.G. Gupta (Tata McGraw Hill)
2. Television Engineering and Video Systems-R. G. Gupta (Tata McGraw Hill)
3. Basic Television and Video systems-Bernord Grob
4. Principles of Multimedia- Ranjan Parekh (Tata McGraw Hill)
5. Multimedia Fundamentals (Vol I: Media coding & content processing) 2nd ed – Steinmetz R., Nahrstedt K. (Pearson Ed.).
6. Data Compression: The Complete Reference – David Salomon, Springer, Fourth Edition, 2007.

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B.E. (Electronics & Telecommunication Engineering) Part-II

EMBEDDED SYSTEMS

Teaching Scheme:
Theory: 04 hrs/week
Practical: 02 hrs/week

Examination Scheme:
Theory: 100 marks
Term Work: 25 marks
OE: 50 marks

- **Course Objectives :**
  1. To make student realize different aspects and application areas of embedded systems.
  2. To make student understand ARM core architecture.
  3. To make student understand interfacing of input & output devices
  4. To introduce to student concepts of Real time operating system.

- **Course Outcomes: Student will be able to**
  1. To design, execution and evaluation of experiments on embedded platforms
  2. To analysis, design and testing of systems that include both hardware and software.

Section - I

Unit 1: Embedded system Introduction [08 hrs]

Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions, memory management, hardware and software design and testing.

Unit 2 : System Architecture [10 hrs]

Introduction to ARM core architecture, LPC 2148**,** ARM extension family, instruction set, thumb instruction set, Pipeline, memory management, Bus architecture, study of on-chip peripherals like I/O ports, timers, counters, interrupts, on-chip ADC, DAC, RTC modules, WDT, PLL, PWM, USB etc.

Unit 3 : Communication protocols [06 hrs]

Brief overview of SPI, SCI, SSP, I^2C, CAN, USB etc

Section - II

Unit 4 : Interfacing and Programming [10 hrs]

Basic embedded C programs for on-chip peripherals studied in system architecture. Need of interfacing, interfacing techniques, interfacing of different displays and I/O devices.

Unit 5 : Real Time Operating System Concept [10 hrs]

Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS. Introduction to *µcos* .

Unit 6: Case Study of Embedded system [04 hrs]

Case study of embedded system like digital camera, Mobile phones, Mobile Internet Device (MTD)

Term Work

Term work shall be based on minimum eight experiments using Embedded C. At least one experiment shall be included from each below group-

GROUP - A

1. I / O operations
2. Timers / counter

GROUP - B

1. Interrupts
2. UART operation

GROUP - C

1. I^2C Protocol.
2. CAN Protocol.

GROUP - D

1. Interfacing LCD
2. Interfacing Keyboard and display key pressed on LCD
3. Interfacing stepper motor

GROUP - E

1. RF communication
2. AT commands and interface of GSM modem

GROUP - F

1. USB protocol and transferring data to PC.
2. Algorithm /program for the microcontroller for low power modes.

GROUP - G

1. Interfacing 4 x 4 matrix keyboards and 16 x 2 characters LCD displays to microcontroller / microprocessor and writing a program using RTOS for displaying a pressed key.
2. Writing a scheduler / working with using RTOS for 4 tasks with priority. The tasks may be keyboard, LCD, LED etc. and porting it on microcontroller/ microprocessor.

GROUP - H

1. Implementing a semaphore for any given task switching using RTOS on microcontroller board.
2. Creating two tasks, which will print some characters on the serial port, Start the scheduler and observe the behavior.

Text books:

1. Embedded systems: a contemporary design tool, James K. Peckol- Wiley India
2. Embedded systems software primer- David Simon - Pearson
3. ARM System-on-Chip Architecture- Steve Furber - Pearson
4. Jean J Labrose - MicroC / OS-II, Indian Low Price Edition

Reference Books:

1. DR.K.V.K.K. Prasad - Embedded / real time system - Dreamtech
2. Iyer, Gupta - Embedded real systems Programming -TMH
3. Steve Heath - Embedded System Design- Neuwans
4. Frank Vahid - Embedded Systems - Wiley India
5. Embedded Systems, Rajkamal -TMH.
6. ARM System Developer's Guide, Designing and Optimizing System Software - Andrew N. Sloss , Dominic Symes, Chris Wright - Morgan Kaufmann Publisher.
7. Datasheet of LPC 2148

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B.E.(Electronics and Telecommunication Engineering) Part-II

Elective-II

WIRELESS SENSOR NETWORKS

Teaching Scheme:
Lectures:4 Hrs/Week
Practical :2 Hr/Week

Examination Scheme:
Theory:100 Marks
Term Work: 25 Marks

Course Objective:

1. To understand the basics of Wireless Sensor Networks with its architecture, infrastructure, associated protocols and IEEE standards.
2. To know the applications of RFID technology with respect to Wireless Sensor Network.
3. To get familiar with Electromagnetic Compatibility aspects and Government regulations.

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

1. Know Wireless Sensor scenario with its challenges, architecture and protocols.
2. Apply their knowledge for the implementation of the Wireless Sensor Network in the health and rural environment applications.
3. Use of Wireless Sensor scenario with proper Electromagnetic Compatibility conditions.

Section – I

Unit 1: Introduction to Wireless Sensor Network [04 hrs]

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, applications of WSN and Mobile adhoc networks and wireless sensor networks.

Unit 2: Architectures of WSN [09 hrs]

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

Unit 3: Infrastructure Establishment [09 hrs]

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

Section – II

UNIT 4: Protocols and Standards [05 hrs]

MAC protocol- Low duty cycle and wake up concepts, Connection based protocols, Schedule based protocols and The IEEE 802.15.4 MAC protocol.

UNIT 5: Applications of RFID in WSN [10 hrs]

Physics and Geometry of RFID, Backscatter Communication, Antenna Directivity and Gain, Design Automation for RFID Tags and Systems, RFID Physical Layer Design Automation, RFID Controller Design Automation, Applications of RFID: Identification and data capture, Health care and Massive incidents.

UNIT 6: Electromagnetic Compatibility [05 hrs]

Aspects of EMC, Electrical Dimensions, Units, EMC Requirements for Electronic Systems, Governmental Requirements.

List of Experiments Minimum 8 experiments based on following topics,

1. Introduce students to network simulation through the NetSim simulation package.
2. Simulate a three nodes point-to-point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
3. Simulate a four node point-to-point network with the links connected as follows: n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.
4. Simulate the different types of Internet traffic such as FTP and TELNET over a network and analyze the throughput.
5. Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
6. Practical based on RFID application.

Text Books:

1. Protocols and Architectures for Wireless Sensor Networks -Holger Karl & Andreas Willig - John Wiley, 2005.
2. Introduction to Electromagnetic Compatibility - Clayton R. Paul, John Wiley,1982,2nd Ed.
3. RFID Handbook: Application, technology, security and privacy -Sayed Ahson, Mohhamad Ilyas- CRC Press.

References:

1. Wireless Sensor Networks- Technology, Protocols, and Applications - Kazem Sohraby, Daniel Minoli, & Taieb Znati - John Wiley, 2007.
2. Wireless Sensor Network Designs - Anna Hac - John Wiley, 2003.

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B.E.(Electronics and Telecommunication Engineering) Part-II

Elective-II

PATTERN RECOGNITION

Teaching Scheme:
Lectures:4 Hrs/Week
Practical :2 Hr/Week

Examination Scheme:
Theory:100 Marks
Term Work: 25 Marks

Course Objectives:

1. To give knowledge about the fundamentals of Pattern Recognition.
2. To brush up knowledge of Probability & different parameters.
3. To introduce mathematical tools needed for Pattern Recognition
4. To introduce parametric and non-parametric techniques, unsupervised learning and clustering concepts of pattern recognition

Course Outcomes:

On completion of the course, student will be able to

1. Implement various pattern recognition tasks & techniques
2. Apply the basic knowledge about neural network & Fuzzy technique
3. Knowledge about unsupervised learning and clustering concepts & case studies

Section-I

Unit 1 : Introduction [03hrs]

Machine perception, Pattern Recognition systems, Design cycle, Learning and Adaptation, Applications of Pattern Recognition.

Unit 2 : Probability [07 hrs]

Probability of Events, Random variables, Joint distributions and Densities, Moments of Random Variables, Estimation of parameters from samples, Minimum Risk Estimators.

Unit 3: Statistical Decision Techniques [06 hrs]

Bayesian Decision Theory – Continuous features, Minimum Error – Rate Classification, Classifiers, Discriminant Functions and Decision Surfaces, Normal density, Discriminant Functions for the Normal Density, Bays Decision Theory – Discrete Features.

Unit 4 : Maximum- Likelihood and Bayesian Parameter Estimation [08 hrs]

Maximum- Likelihood estimation, Bayesian Estimation, Bayesian Parameter Estimation (Gaussian case), Bayesian Parameter Estimation (General theory), Problems of Dimensionality, Hidden Markov Models.

Section-II

Unit 5 : Non- parametric Techniques **[06 hrs]**

Density Estimation, Parzen Windows, K- Nearest Neighbor Estimation, Nearest Neighbor Rule, Metrics and Nearest- Neighbor Classification

Unit 6 : Clustering **[08 hrs]**

Introduction, hierarchical clustering :- single linkage, complete linkage, Average linkage, Algorithms, wards method. Partitional clustering : - Forgy's, K means, lsodata algorithm.

Unit 7 : Object Recognition **[06 hrs]**

Knowledge representation, statistical pattern recognition, Neural Networks:- feed forward network, unsupervised learning, Syntactic pattern recognition, fuzzy Optimization technique in recognition :- genetic algorithm, simulated annealing.

Unit 8 : Case Studies **[06 hrs]**

Optical Music recognition system, automated identification of airway trees, automated image analysis in cardiology.

Term work

Term work shall consist of minimum eight experiments out of following, using suitable software tool

1. Estimation of Probabilities.
2. Joint Distributions and Densities.
3. Mean and Variance of Normal Distributions.
4. Co-variance matrix of Multivariate normal density.
5. Euclidian distance between two arbitrary points.
6. Illustrate the fact that the average of a large number of independent random variables will approximate a Gaussian.
7. Find Maximum likelihood values.
8. Estimating the Classification Error rate.
9. To use Hidden Markov Models for classifying sequences of four visible states.
10. Generate points according to a Uniform distribution in a unit cube and to
11. Generate points from a spherical Gaussian density centered on the origin.
12. Classify an arbitrary test point based on the Parzen Window estimates.
13. Form a K-nearest neighbor classifier for the 3-D data.
14. Implement Gradient Descent Algorithm.
15. Computing maximum likelihood values of the parameters.
16. Implement k-means clustering.
17. Implement the basic hierarchical Agglomerative Clustering algorithm.

Text Book :

"Pattern Classification", R.O. Duda, P.E. Hart, D.G. Stork, Wiley India, Second Edition.

Reference Books:

1. "Pattern Recognition and Image Analysis", E. Gose, R. Johnsonbaugh, S. Jost, PHI.
2. "Image Processing, Analysis, and Machine Vision", M. Sonka, V. Hlavac, R. Boyle,Thomson Pub., Second Edition.
3. "Pattern Recognition Principles" Gonzalez "Pattern Recognition ", Schalkoff, Wiley India.

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B.E.(Electronics and Telecommunication Engineering) Part-II
Elective-II
DSP PROCESSOR AND APPLICATION

Teaching Scheme:

Lectures:04 Hrs/Week
Practical :02 Hr/Week

Examination Scheme:

Theory:100 Marks
Term Work: 25 Marks

Objectives:
Students will be able to:

1. Understand mathematical aspects of DSP
2. Know fundamentals of DSP Processor
3. Develop application programs in C54X
4. Study the architecture and programming of TMS320C5X, TMS320C3X Processors for real time applications.

Outcomes:
After completion of this course, student will be able to

1. Apply mathematical fundamentals to DSP Processors
2. Use fundamentals of Programmable DSP Processors for different applications
3. Write Assembly language programs for DSP Processors
4. Knowledgeable in the architecture and programming of TMS320C5X, TMS320C3X Processors for real time applications.

SECTION I

Unit 1: Numeric Presentation and arithmetic [04 hrs]

Number formats for signals and coefficients in DSP systems, Dynamic Range and precision, Sources of Error in DSP implementations, A/D conversion errors, DSP computational errors, D/A conversion errors.

Unit 2: Fundamentals of programmable DSPs [10 hrs]

Multiplier and multiplier accumulator, modified bus structure and memory access in P-DSPs, multiply access memory, multi-ported memory, VLIW architecture, pipelining, special addressing modes in P-DSPs, on-chip peripherals, computational accuracy in DSP processors

Unit 3: TMS320C5X Processors **[10 hrs]**

Architecture, Assembly Language Syntax, Addressing Modes Assembly Language Instructions-Pipeline Structure, Operation Block Diagram of DSP Starter Kit, Application Program for Processing Real Time Signals

Section-II

Unit 4: Programmable Digital Signal Processors **[12 hrs]**

Data Addressing Modes of TMS320C54XX DSPs, Data Addressing Modes of TMS320C54XX Processors, Memory Space of TMS320C54XX Processors, Program Control, On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Structure of TMS320C54XX Processors

Unit 5: Application programs in C54X **[06 hrs]**

Pipeline operation, Code composer studio, overview of the 'C5402-Based DSK', Introduction to C54X Assembly language programming, and Applications programs in C54X.

Unit 6 : Advanced Processors **[06 hrs]**

Code composer studio- Architecture of TMS320C6X, Architecture of Motorola DSP563XX, Comparison of the features of DSP family processors.

Term Work:
Minimum 8 experiments should be performed based on above topic using DSP Processor kit and code composer studio.

Text Books:

1. Digital Signal Processors, Architecture, Programming - B. Venkata Ramani and M. Bhaskar - TMH, 2004.
2. DSP Implementation using DSP microprocessor with Examples from TMS32C54XX - Avatar Singh, S.Srinivasan -Thamson 2004
3. Digital signal processing- Salivahanan,Ganapriya - TMH ,second Edition

Reference Books:

1. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.
2. Digital Signal Processing - S.K. Mitra -Tata McGraw-Hill Publication, 2001