Solapur University, Solapur
B. E. (Electronics & Telecommunication Engg.) – Part I & II w.e.f. Academic Year 2010-2011

B. E. (Electronics & Telecommunication Engg.) – Part I

Sr. No.	Subject	Teaching Scheme				Examination Scheme				
		L	T	P	Total	Th.	TW	POE	OE	Total
1	Computer Communication Network	4	-	2	6	100	25	-	25	150
2	VLSI Design	4	-	2	6	100	25	25	-	150
3	Mobile & Satellite Communication	3	1	-	4	100	-	-	-	100
4	Random Signal Theory & Coding	3	1	--	4	100	25	-	25	150
5	Elective – I	4	-	2	6	100	25	-	-	125
6	Seminar & Project	-	-	4	4	-	50	-	-	50
7	Vacational Training	-	-	-	-	-	25	-	-	25
Total		**18**	**2**	**10**	**30**	**500**	**175**	**25**	**50**	**750**

Elective – I **Advance DSP.**
Image Processing
Artificial Neural Network

B. E. (Electronics & Telecommunication Engg.) –II

Sr. No.	Subject	Teaching Scheme				Examination Scheme				
		L	T	P	Total	Th.	TW	POE	OE	Total
1	Broad Band Communication	3	1	-	4	100	25	-	-	125
2	Audio Video Engineering	4	-	2	6	100	25	-	25	150
3	Embedded Systems	4	-	2	6	100	25	-	25	150
4	Elective – II	4	-	2	6	100	25	-	-	125
5	Project	-	-	8	8	-	100	100	-	200
Total		**15**	**1**	**14**	**30**	**400**	**200**	**100**	**50**	**750**

Elective – II **Pattern Recognition**
Fuzzy Logic
DSP Processors & Application

Note:

- Minimum strength of the students for Elective be 15.
- The batch size for the practicals/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 about 4 students.

Solapur University, Solapur
B.E. (Electronics & Telecommunication Engg.) Part – I

Computer Communication Network

Lectures : 04 hrs/week **Theory: 100 marks**
Practical: 02 hrs/week **TW: 25 marks**
OE: 25 marks

Objectives / Outcomes:

1) To understand basic concepts of computer networks.
2) To study various Layers in network software.
3) Understanding advanced service protocols related to networks and Internet.
4) Students understand the fundamentals of data communication and communication networks.
5) Students have knowledge of various network protocols including TCP/IP, and demonstrate the skills to design and evaluate network protocols.

Section - I

1: Data Communication: (6)
Components – Direction of data flow, networks-components and categories, types of connections, Topologies. ISO – OSI Model, Transmission media- Coaxial cable, fiber optic cable, Modems, RS232 interfacing sequences.

2: Data Link Layer: (7)
Framing, Error detection and correction, parity, LRC, CRC, Hamming code, stop and wait, go back N, selective repeat, ARQ, sliding window, HDLC, Medium access control.

3: Network Layer (6)
Internetworks – packet switching and datagram approach, IP addressing methods, subnetting, routing – distance vector routing, link state routing, shortest path routing, flow based.

4: Transport Layer (5)
TCP/IP, Datagram, Fragmentation, IP protocol, UDP, TCP.

Section – II

5:TCP/IP Protocol Suit: (7)
TCP/IP vs. OSI, ARP, RARP, ICMP – Message format, Message Delivery, Ping, Echo request – reply, different reports.

6: Service Protocols – I: (6)
DHCP, mobile IP, Internet routing protocol, Multicast routing, IGMP.

7: Service Protocols – II: (7)
DNS, FTP, E-mail, TELNET, SMTP, HTTP, RTP

8: Internet Security: (4)
Encryption, Decryption ,IPV6, Internet security, fire walls.

Text Books:

1. Computer Networks – Andrew S. Tanenbaum-PE pub.
2. TCP/IP Protocol Suit – Forouzan-Tata MGH pub.
3. Internetworking with TCP/IP, principles protocols and architectures-Comer-PHI pub.

Reference Books.

1. Data Communication – P.C.Gupta
2. TCP/IP Illustrated, The Protocols – W. Richard Slevens, G.Gabrani –PE pub.
3. Data and computer communication – William Stallings. - PE pub.

Practical List-

1. Different network components, Ethernet card installation, IP addressing.
2. Inter-computer communication through serial port- character transfer using simplex, full duplex mode.
3. Pear to pear computer network.
4. Different LAN standards.(IEEE 802.3, 802.4, 802.5, 803.11)
5. Installation of Network operation system (Linux OS) .
6. Computer Network commands.
7. File transfer through serial port- (implementation of any flow control mechanism)
8. MODEM and it's Interface.
9. Client Server computer Network.

Solapur University, Solapur

B.E. (Electronics & Telecommunication Engg.) Part – I

VLSI Design

Lectures : 04 hrs/week **Theory: 100 marks**
Practical: 02 hrs/week **Term Work: 25 marks**
POE: 25 marks

Objectives / Outcomes:

1. To have programming ability.
2. Understand detail architecture of commercial devices.
3. To have ability to design simple circuits to simple processors.
4. To be familiar with EDA tools.
5. Ability of designing Digital System through programming
6. Became familiar with mapping of commercial devices
7. Usability of EDA tools

Section-I

1. VHDL programming (10)

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.

2. VHDL model for combinational logic (7)

4-bit binary adder , multiplier ,divider ,multiplexer ,comparator ,decoder.

3 .VHDL model for sequential logic (7)

Latches ,Flip-flops , counters (synchronous and asynchronous) ,shift registers ,state machines , static RAM. Design example – simple processor.

Section - II

4. CMOS Design **(9)**

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

5. Architecture of commercial devices **(9)**

Simple PLDs, CPLD ,PAL ,PLA,Implementation of logic design in SPLD , CPLD and FPGA , Altera Flex 10k , Altera Max 7000 ,Virtex 4 Xtreme DSP Slice .

6. EDA Tools **(6)**

Simulation , Synthesis , Boundary scan ,Testability

Term Work:

Term should consist of minimum 10 programs which covers all part of programming.
A simple processor should be implemented.

Reference books:

1.Fundamentals of Digital logic design with VHDL, Brown ,Vranesic – SiE(Second edition).
2.Digital Systems Design using VHDL, Charles H. Roth.- PWS
3.VHDL primer ,J.Bhasker – Prentice Hall
4.Principles of CMOS VLSI Design, Neil H.E.Weste, Kamran Eshraghian - Pearson
5. Essentials of VLSI circuits and Systems, Kamran Eshraghian, Duglus Pucknell –PHI
6. Digital Logic Design and VHDL- Phadake –Wiley India

Links:

www.origin.xilinx.com

Solapur University, Solapur
B.E. (Electronics & Telecommunication Engg.) Part – I

Mobile and Satellite Communication

Lectures : 03 hrs/week **Theory: 100 marks**
Tutorial: 01 hrs/week

Objectives / Outcomes: To study

1) Cellular concept
2) GSM,IS-95(CDMA),GPRS
3) Wireless LAN, Wireless ATM and their standards
4) Orbital Mechanics
5) Satellite Subsystems
6) VSAT, Satellite Navigation and GPS

Section – I

1) Introduction to Mobile Communication and Cellular Concepts: Block Diagram, Data Technologies, Mobile and wireless devices, cellular concept, frequency reuse, channel assignment, hand-off and multiple access technologies. **[8 hrs]**

2) Digital Cellular Mobile Systems: GSM-Services and features of GSM, Radio Subsystems, channel type, frame structure, CDMA-(IS-95) frequency and channel specification, forward and reverse CDMA channels, GPRS**.** **[8 hrs]**

3) Wireless LAN: Introduction, Infrared radio transmission, Infrastructure and Ad-hoc networks, IEEE 802.11, HIPERLAN, Bluetooth.

Wireless ATM: Reference Model, Functions, Radio access layer, Handover, Location Management, Addressing**.** **[8 hrs]**

Section – II

4) Orbital Mechanics and Launchers:
Orbital Mechanics, Look angle determination, Orbital perturbations, Orbital determination, Launchers and Launch Vehicles, Orbital effects in communication system performance. **[7 hrs]**

5) Satellites:
Satellite Subsystems, Attitude and control systems (AOCS), Telemetry, Tracking, Command and Monitoring, Power systems, Communication subsystems, Satellite antennas, Equipment reliability and space qualification. **[7 hrs]**

6) Satellite Systems:
Overview of VSAT Systems, Network Architecture
Low Earth Orbit and Non-Geo-Stationary Satellite Systems**:** Orbit considerations, Coverage and frequency Consideration, Operational NGSO constellation design: Irridium, Teledesic

Home Satellite TV, Digital DBS TV, Satellite Radio Broadcasting
Radio and Satellite Navigation, GPS Position Location Principles, GPS Recivers and codes.
[10hrs]

Reference Books:

1) Mobile Communications (2nd Edition)-Jochen Schiller (Pearson Education.)
2) Mobile and personal communication Systems and Services- Raj Pandya (Prentice Hall of India)
3) Wireless Communications (principles and practices)-(2nd Edition)-Theodore S. Rappaport (Prentice Hall of India)
4) Satellite Communications – Timothy Pratt, Charles Bostian, Jeremy Allnutt John Wiley & Sons (II Edition)
5) Satellite Communication- Monojit Mitra (PHI)
6) Satellite Communications – Dennis Roody (McGraw Hill)
7) Wireless and Mobile Networks – Dr Sunilkumar S. Manv – Wiley India

Note: Students, as a part of their term work, should visit satellite earth station and submit a report of visit.

Solapur University, Solapur
B.E. (Electronics & Telecommunication Engg.) Part – I

Random Signal Theory & Coding

Lectures : 03 hrs/week **Theory: 100 marks**
Tutorial: 01 hrs/week **TW: 25 marks**
OE: 25 marks

Objectives / Outcomes: To study

1. Basics of random signal theory
2. Properties of random processes
3. Concepts of linear block code, cyclic codes, Turbo codes, Convolution codes
4. Techniques to develop all above codes.

Section – I

1) Random Signal Theory : (6)

Probability, Joint & conditional probability, probability mass functions, statistical average, continuous random variables – PDF and statistical averages, random processes – stationary, time average & ergodicity, power spectral density of stationary random processes.

2) Linear Block Codes : (8)

Vector spaces, vector subspaces, Linear block code example, generator matrix, Symmetric linear block codes, Parity-check matrix, Syndrome testing, Error correction, Decoder implementation.

3) Cyclic Codes : (8)

Algebraic structure of cyclic codes, Binary cyclic code properties, Encoding systemic 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

4) Turbo Codes : (4)

Turbo code concepts, Long-Likelihood algebra, Product code example, Encoding with Recursive Codes, A feedback decoder, The MAP decoding algorithm, MAP decoding example.

5) Convolution Encoding : (10)

Convolution Encoding, Convolutional encoder representation : Connection Representation, State reprentation and the state diagram, The tree diagram, The Trellis diagram, Formulation of the Convolutional 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.

6) Properties of Convolution Codes : (8)

Distance Properties of Convolution Codes, Systemic and Nonsystematic Convolution Codes, Catastrophic Error propagation in Convolution Codes, Performance bounds for Convolution Codes, Coding gain, Best known convolution codes, Convolution code rate Trade-off, Soft decision Viterbi decoding.

Text Books :

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

Reference Books :

- Introduction to Probability Models 6th edition by Sheldon M. Ross [Pearson].
- Digital Communication - Siman Haykin - Wiley
- Modern Digital &Analog Communication System –B.P. Lathi - Oxford

Solapur University, Solapur
B.E. (Electronics & Telecommunication Engg.) Part – I
Elective – I

Advanced Digital Signal Processing

Lectures : 04 hrs/week **Theory: 100 marks**
Practical: 02 hrs/week **Term Work: 25 marks**

Objectives / Outcomes: To study

1. Linear filtering method
2. Multirate DSP
3. Linear predictor
4. Method for power spectrum estimation
5. Adaptive filters

Section- I

1. DFT, Properties of DFT : (5)
Use of DFT in linear filtering of long data sequences, frequency analysis of signals using DFT, Linear filtering approach to computation of DFT, the Gortzel algorithm, the chirp-Z algorithm.

2. Multirate DSP : (7)
Introduction, Decimation, Interpolation, Sampling rate conversion, Implementation of Sampling rate conversion, Multistage implementation of sampling rate conversion, Application of multirate DSP, Digital Filter bank.

3. Linear prediction and optimal linear filters : (6)
Forward and backward linear prediction, the optimum reflection coefficient for the forward and backward predictors. Relationship of an AR process to linear prediction. The Levinson Durbin algorithm.

Section- II

4. Power Spectrum Estimation: (7)
Estimation of spectra from finite duration observation of signals, computation of energy density function, Estimation of autocorrelation and power spectrum of random signal, Non parametric methods for a power spectrum estimation, Bartlett window and Welch window.

5. Adaptive filters : (7)

Application of adaptive filters, configuration of adaptive filter, main component of adaptive filter, LMS algorithm, RLS algorithm, Adaptive lattice-ladder filter.

6. Application to Speech processing and Radar : (4)

Speech Theory, Speech processing, Application to radar.

Term Work :

Term Work should consist of minimum 6 experiments based on above syllabus.

Reference Books :

1. Digital Signal Processing : Principles, Algorithms and Application , By John Proakis/ Dimitris G. Manolakis, Published by Pearson Education.

2. DSP A practical approach , By E. C. Ifleachor and B. W. Jervis, Published by Pearson Education, 2nd edition.

3. Advanced DSP , By Proakis, Rade, Ling Published by Mc Millan Publication.

4. Speech Signal Processing, By Rabinar , Gold.+

Solapur University, Solapur
B.E. (Electronics & Telecommunication Engg.) Part – I
Elective – I

Image Processing

Lectures : 04 hrs/week **Theory: 100 marks**
Practical: 02 hrs/week **Term Work: 25 marks**

Objectives / Outcomes:

1) to give opening to the field of Digital Image Processing.
2) to give knowledge about the fundamentals of Digital Image Processing.
3) to introduce mathematical tools needed for image processing tasks.
4) to give basics of image enhancement and restoration techniques.
5) to provide introduction to the image compression field.
6) to study the image analysis tools.

Section-I

1 : Fundamentals of Digital Image Processing : [7]

Fields of use of Digital Image Processing, Fundamental steps in Digital Image Processing, Image sensing and acquisition, Image sampling and quantization, Basic relationships between pixels, Types of digital images and file formats, Color fundamentals, Color models, Pseudo-color image processing.

2 : Image Transforms : [7]

Two dimensional Orthogonal and Unitary transform, Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), Discrete Cosine Transform (DCT), K-L Transform, Haar transform, Discrete Wavelet Transform (DWT). (orientation be given towards application of these transforms to the Images).

3 : Image Enhancement : [6]

Basic gray level transformation, histogram equalization,
Spatial domain : Basics of spatial filtering, Smoothing and Sharpening of images.
Frequency domain: Basics of frequency domain filtering, Smoothing and Sharpening of images.

Section-II

4 : Image Restoration: **[5]**

Model of Image degradation / restoration process, Noise models, Restoration in the presence of Noise – spatial filtering, Periodic noise reduction by frequency domain filtering, estimating the degradation function, Inverse filtering.

5 : Mathematical Morphology : **[4]**

Binary Morphology, Dilation and Erosion, Opening and Closing, Hit and Miss transform, Thinning.

6 : Image Compression : **[5]**

Fundamentals, Image compression models, Error-free (Loss less) compression, Lossy compression.

7 : Image Analysis : **[6]**

Detection of discontinuities, Gradient, Compass, and Laplace operators, Boundary extraction – connectivity, contour following, edge linking and heuristic graph searching, Boundary representation – chain codes, Segmentation.

Text Book :

"Digital Image Processing", R.C. Gonzalez, R.E. Woods, Pearson Education,

Second Edition.

Reference Books:

1) "Image Processing, Analysis, and Machine Vision", Thomson Pub., M. Sonka, V. Hlavac, R. Boyle, Second Edition.
2) "Digital Image Processing", Wiley Pub., W.K. Pratt, Third Edition.
3) "Digital Image Processing and Analysis", B. Chandra & D.D. Majumdar, PHI pub., First Edition
4) "Fundamentals of Digital Image Processing", A.K. Jain, Pearson Education, Second Edition.

Practical: (Minimum 12 to be performed)
(using C language or MATLAB or any other suitable software)

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

Solapur University, Solapur
B.E. (Electronics & Telecommunication Engg.) Part – I
Elective – I

Artificial Neural Network

Lectures : 04 hrs/week **Theory: 100 marks**
Practical: 02 hrs/week **Term Work: 25 marks**

Objectives / Outcomes:

1) To introduce basic concepts biological & Artificial Neural Network.
2) To study the types of learning rules for ANN
3) To study different types of ANN
4) To understand applications of ANN to various fields.

Section- I

1. Basics of ANN: **(6)**

Introductions, ANN, model of neural network, topologies, perceptions, basic learning rules.

2. Single Layer Perception Classifier: **(6)**

Classification model, discriminant functions, linear machines & min. distance classification, non parametric training concept, classification using perception, multi category perception network.

3. Learning Rules: **(8)**

Supervised learning in single unit setting, Reinforcement learning, unsupervised learning, competitive learning, SOFM.

4. Feed forward Networks: **(8)**

Pattern classification, delta rule, bank propagation training, learning factors, expert layered network, RBF network, ART network.

Section- II

5. Feed back Network: **(8)**

Hop field network, gradient hop field network, (discrete & continuous) transient response, Boltzman machine.

6. Associative memories: **(6)**

Recurrent auto associative memory, & its analysis, BAM

7. Application of ANN: **(4)**

Biomedical field, character recognition network , control applications

Experiments:

Minimum 8 experiments on ANN using MATLAB toolbox or C/C++.

Reference Books:

1. Artificial Neural Network – B. Yegnanarayana - PHI- 11th edition.

2. Introduction to Artificial Neural Networks – Jacek M. Zurada– Jaico publication

3. Fundamentals of Artificial Neural Networks – By mohamad H. Hassoun,- PHI

Solapur University, Solapur
B.E. (Electronics & Telecommunication Engg.) Part – I

Seminar & Project

Practical: 04 hrs/week **Term Work: 50 marks**

1) Project group should consist of students not more than 4 students
2) All the students in the group should deliver seminars and at least one student from the group should deliver seminar based on project.
3) The group should submit a synopsis of the project to the department and a report based on seminars.
4) A group should complete the design of project in this semester.
5) The term work marks should be based on performance in seminar delivered and preparation of project work completed.

Solapur University, Solapur
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Broad Band Communication

Lectures : 03 hrs/week **Theory: 100 marks**
Tutorials: 01 hrs/week **Term Work: 25 marks**

Objectives / Outcomes :

1) Understanding working of a digital network.
2) Introducing integration of various services on single ISDN line.
3) To study various functions of narrowband and broadband ISDN.
4) Understanding scope of ATM networks.
5) Compare working of digital switching with analog, its advantages.
6) Enable to explain principle of ISDN
7) Understand the need of B-ISDN, services of B-ISDN
8) Undestnding of ATM operation

Section - I

1. 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. **(6)**

2. ISDN – Integration of Transmission and Switching, Analog and Digital switching, Principles of ISDN, User interface, Architecture, ISDN standards, I-series recommendations. **(7)**

3. ISDN: interface and Functions – Transmission structure, User network interface, ISDN protocol architecture, ISDN connections, Addressing, Interworking, B-ISDN architecture and standards**.** **(8)**

Section – II

4. B-ISDN Services and protocols – Conversational, Messaging, Retrieval, Distribution, Business and Residential requirements. User plane, Control plane, Physical layer, Line coding, Transmission structure, Signal Hierarchy, System Hierarchy. **(7)**

5. ATM – Overview, 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. **(10)**

6. ATM switching – ATM switching building blocks, ATM cell processing in a switch, Matrix type switch, Input, Output buffering, Central buffering, Performance aspects of buffering switching networks. - **(6)**

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

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

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B.E. (Electronics & Telecommunication Engg.) Part – II

AUDIO - VIDEO ENGINEERING

Lectures : 04 hrs/week **Theory: 100 marks**
Practical: 02 hrs/week **Term Work: 25 marks**
OE : 25 marks

Objectives / Outcomes: To study

1. Concepts of disc recording and reproduction
2. Basics of Multimedia
3. Concepts of Color Television (CTV) Transmitter and Receiver.
4. Working Principle of Digital Television (DTV) and High Definition Television (HDTV).
5. Satellite receiver, Direct to Home (DTH) Receiver, Digital Video Disc (DVD) player

Section- I

1)Concepts of: Principle of disc recording and reproduction, block diagram of disc recording and reproduction systems, Production of Disc Records on Mass Scale, Coarse- grooves and micro grooves, construction of cutter stylus, Playback needles, cartridges or pick up units, Equalisation in Disc Recording/ Playback Systems, Turntable, Principle of magnetic recording and reproduction, Recorded wavelength, Gap-width and tape speed, need for biasing, DC & AC biasing, tape transport mechanism, advantages and disadvantages of tape recording, Block diagram of tape recording and reproducing system, Wow and flutter distortions, Rumble, Hissing noise, Noise Reduction Techniques, Quality of Sound on Tape, Types of optical recording of sound, Methods of optical recording of sound on film, Reproduction of Sound from Films, Compact Disc, Optical Recording on Disc, Playback Process, Comparison of Compact and Conventional Discs. **[12]**

2) Multimedia: Definition, Elements of multimedia system, Need of multimedia Audio applications, audio capture, compression, standards Video applications, video capture, Television, compression, standards. **[3]**

3) Basics of Television: Introduction to video systems, Sound and picture transmission, scanning process, Camera pick up devices(image orthicon, vidicon, plumbicon,CCD), camcoder, Video signal, aspect ratio, horizontal and vertical resolution, video bandwidth and interlaced scanning, Composite video signal for monochrome TV video signal standards, sound and video modulation, VSB transmission and reception (CCIR-B standards), composite colour signals, compatibility, TV transmitter block diagrams**.** **[9]**

Section- II

4)Composite color signal introduction: colour spectrum, compatibility considerations,chromaticity diagram, colour TV signals, luminance signal, chrominance signal recombination to natural colour voltages, interleaving process, colour subcarrier frequency, colour picture tube, shadow mask, gun assembly, in-line guns, precision in line colour picture tube, colour picture tube requirements, degaussing, purity convergence, circuit colour receivers set up procedure, trouble in colour picture tube. **[8]**

5) Colour TV systems: elements of NTSC colour system, Basic colour TV transmitters, (NTSC and PAL), basic parameters of SECAM system, SECAM coder and decoder, Line by line switch and colour identification circuit, delay line, basic features of PAL system, PAL coder and decoder, colourpixed video signal (PAL). **[6]**

6) Colour TV receivers: antenna, RF tuner, AFT, Video IF amplifier, video detector sound section, first video amplifier delay line colour burst circuit, AGC amplifier, phase discriminator, phase identification amplifier and colour killer, reference oscillator, vertical deflection system, horizontal deflection system, EHT . **[5]**

7) High definition TV, satellite TV, cable TV, working of block converter, Introduction to digital television, how digital television works, Remote control , DVD, DTH **[5]**

List of Experiments (any ten)

01 Measurement of speed for 33 r.p.m. and 45 r.p.m. record disc playback system
02 Determination of max recording frequency and tap speed for tape reproduction system.
03 Design band III channel Yagi antenna and To find out channel No. for given antenna.
04 Observation and measurements of waveforms at outputs of various internal stages of Monochrome TV receiver
05 Measurement duty cycle for 5 volt and 50 KHz in Switched mode power supply.
06 Observation and measurements of waveforms at outputs of various internal stages of Colour TV system.
07 Observation and working of Television transmission (CCTV).
08 Analysis and observation of Composite video signal.
09 Observation of amplitude and frequency of various colour bands of colour video composite signal.
10 Observation of Satellite TV system with uplink and downlink.
11 Observation of different colour combination of Television receiver
12 Multimedia : working of VCD player
13 To store the audio signals in wave and mp3 format

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

Reference Books:

1) Audio and Video Engineering Systems-R.G. Gupta (Tata McGraw Hill)
2) Colour Television Theory and Practice- R. R. Gulati (New Age International Publishers)
3) Television Engineering and Video Systems-R. G. Gupta (Tata McGraw Hill)
4) Principles of Multimedia- Ranjan Parekh (Tata McGraw Hill)
5) Multimedia in practice Technology & Applications -Judith Jeffcott (PHI)
6) Television and Video Engineering- A. M. Dhake
7) Consumer Electronics-S. P. Bali (Pearson Education)
8) Color TV Theory and Practice- S. P. Bali-(TMH)
9) Basic Television and Video systems-Bernord Grob

Solapur University, Solapur
B.E. (Electronics & Telecommunication Engg.) Part – II

Embedded Systems

Lectures : 04 hrs/week **Theory: 100 marks**
Practical: 02 hrs/week **Term Work: 25 marks**
OE: 25 marks

Objectives / Outcomes:

1) to give opening to the field of Embedded System Design.
2) to give knowledge about the ARM core architecture.
3) to study the interfacing of input & output devices.
4) to give knowledge about the Real time operating system.

Section - I

1.Embedded system Introduction:
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, communication protocols like SPI, SCI, I2C, CAN etc **(10)**

2. System Architecture:
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.
(**10)**

3. Interfacing and Programming:
Basic embedded C programs for on-chip peripherals studied in system architecture. Need of interfacing, interfacing techniques, interfacing of different displays including Graphic LCD (320X240), interfacing of input devices including touch screen etc, interfacing of output devices like thermal printer etc., embedded communication using CAN and Ethernet, RFmodules, GSM modem for AT command study etc.
(**10)**

4. Real Time Operating System Concept:
Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS. Introduction to Ucos II RTOS, study of kernel structure of **Ucos II,** synchronization in Ucos II, Inter-task communication in Ucos II, memory management in Ucos II, porting of RTOS. **(10)**

5. Embedded Linux:
Introduction to the Linux kernel, Configuring and booting the kernel, the root file system, Root file directories, /bin, /lib etc.,Linux file systems, Types of file system: Disk, RAM, Flash, Network. Some debug techniques- Syslog and strace, GDB, TCP /IP Networking- Network configuration, Device control from user space- Accessing hardware directly, Multi processing on Linux and Inter Process Communication- Linux process model and IPCs, Multithreading using pThreads - Threads verses Processes and pThreads, Linux and Real-Time Standard kernel problems and patches.

(10)

Reference Books:

1. Embedded Systems,Rajkamal -TMH.

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

5. DR.K.V.K.K. Prasad - Embedded / real time system, Dreamtech

6. Iyer, Gupta - Embedded real systems Programming , TMH

7. Steve Heath - Embedded System Design , Neuwans

8.Frank Vahid - Embedded Systems , Wiley India

9. Peckol - Embedded Systems , Wiley India

LAB EXERCISE:

- Integrated Development Environment Overview (Project creation, down load and debug)
- Study of JTAG Debugger/on-board debugger-emulator.
- ARM Instructions execution (Barrel Shifter, LDR / STR, SMT / LDM)

List of Practical:

GROUP - A

1) Writing basic C-programs for I / O operations
2) C-Program to explore timers / counter
3) C-programs for interrupts
4) Program to demonstrate UART operation

GROUP - B

5) Program to demonstrate I2C Protocol.
6) Program to demonstrate CAN Protocol.

GROUP - C

7) Program to interface LCD
8) Program to interface Keyboard and display key pressed on LCD
9) Program to interface stepper motor

GROUP - D

10) Program to demonstrate RF communication
11) Program to implement AT commands and interface of GSM modem
12) Implementation of USB protocol and transferring data to PC.
13) Implementation of algorithm /program for the microcontroller for low power modes.

GROUP - E

14) 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.
15) 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 - F

16) Implement a semaphore for any given task switching using RTOS on microcontroller board.
17) Create two tasks, which will print some characters on the serial port, Start the scheduler and observe the behavior.

GROUP – G

18) RTOS based interrupt handling using Embedded Real Time Linux.
19) Program for exploration of (Process creation, Thread creation) using Embedded Real Time Linux.

GROUP – H

20) Program for exploring Message Queues using Embedded Real Time Linux.
21) Ethernet Based Socket Programming using Embedded Real Time Linux.

Note:

1) At least **ONE** practical should be performed from **EACH GROUP**.
2) **TWO** practical should be performed using the **JTAG debugger / on-board Debugger-emulator.**

Solapur University, Solapur
B.E. (Electronics & Telecommunication Engg.) Part – II
Elective – II

Pattern Recognition

Lectures : 04 hrs/week **Theory: 100 marks**
Practical: 02 hrs/week **Term Work: 25 marks**

Objectives / Outcomes:

1) to give opening to the field of Pattern Recognition.
2) to give knowledge about the fundamentals of Pattern Recognition.
3) to brush up knowledge of Probability concepts.
4) to introduce mathematical tools needed for Pattern Recognition.
5) to introduce parametric and non-parametric techniques.
6) to introduce unsupervised learning and clustering concepts of pattern recognition.
7) Students can implement various pattern recognition tasks and techniques using the required software.
8) Student will get knowledge about unsupervised learning and clustering concepts.

Section-I

1 : Introduction : [3]

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

2 : Probability : [7]

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

3 : Statistical Decision Techniques : [6]

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.

4 : Maximum- Likelihood and Bayesian Parameter Estimation: [8]

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

Section-II

5: Non- parametric Techniques : [6]

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

6 : Linear Discriminant Functions : [8]

Linear Discriminant Functions and Decision surfaces, Generalized Linear Discriminant Functions, the Two category Linearly separable case, Minimizing the perceptron Criterion Function, Relaxation procedure, Non Separable Behaviour, Minimum Squared error Procedures, Multi-category generalizations.

7 : Unsupervised Learning and Clustering : [8]

Mixture Densities and Identifiability, Maximum-Likelihood estimates, Application to normal mixtures, Unsupervised Bayesian Learning, Data Description and Clustering, Criterion Functions for Clustering, Hierarchical Clustering, Component Analysis, Low - Dimensional Representations.

8 : Case Study of Classification of White Blood Cells. [2]

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
4) "Pattern Recognition ", Schalkoff, Wiley India.

Practical: (Minimum 12 to be performed)

(using C language or MATLAB or any other suitable software)

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

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Elective – II

Fuzzy Logic

Lectures : 04 hrs/week **Theory: 100 marks**
Practical: 02 hrs/week **Term Work: 25 marks**

Objectives / Outcomes:

1) To introduce basic concepts fuzzy sets.
2) Understanding the relationship between crisp & fuzzy variables.
3) To understand the application of fuzzy in different fields.
4) To understand new concept in fuzzy logic.

Section-I

1. Introduction: **(4)**

Fuzzy sets & membership, classical sets & fuzzy sets.

2. Fuzzy System: **(6)**

Fuzzy relations, Fuzzification, & defuzzification, fuzzy logic & fuzzy system, fuzzy automata development of membership function.

3. Fuzzy Arithmetic: **(5)**

Extension principle, fuzzy arithmetic, approximate methods of extension.

4. Fuzzy classification: **(5)**

Classification by equivalence, clustering, pattern recognition, image processing, syntactic recognition.

Section -II

5**. Fuzzy Decision Making :-** **(8)**

Fuzzy ordering, preference & consensus, multi objective decision, no transitive ranking, multi criterion Decision making, fuzzy ranking method, fuzzy linear programming.

6. Fuzzy Control System : **(4)**

Simple fuzzy controls, fuzzy in process control, fuzzy statistical process control.

7. Fuzzy Application: **(4)**

Fuzzy regression, fuzzy cogitative map, medicine, genetic algorithm.

8. Fuzzy Concepts: **(4)**

Fuzzy neuro system, neuro fuzzy system, type 2 & type 3 fuzzy logic, fuzzy expert system.

Reference Books:

1. Fuzzy logic with engineering application- Timothy J. Ross Wiley Publication

(Second Edition)

2. Fuzzy sets & fuzzy logic _ Theory & application – Jorge Klir / Bo Yaun- PHI

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Elective – II

DSP Processors and Application

Lectures : 04 hrs/week **Theory: 100 marks**
Practical: 02 hrs/week **Term Work: 25 marks**

Objectives / Outcomes:

- The objective of this course is to provide students with an understanding of a DSP processors, their architectures and instruction set.
- To establish fundamental concepts of implementing DSP algorithms using Digital signal processors.

SECTION- I

1. Introduction : (2)
Architecture overview, Fixed and Floating point digital signal processors.

2. TMS320C54X Architecture and Assembly language instructions : (8)
Introduction, Bus structure, CALU, ARAU, index register, ARCR, BMAR, Block repeat registers, Parallel Logic Unit (PLU), Memory mapped registers, Program controller, On chip memory & peripherals, Addressing modes & instructions.

3. ADSP family : (8)
Analog 21061 series sharc block diagram, Interrupt Hardware, memory quantization, central arithmetic logic unit, system control , memory addressing modes, instruction set, Software applications – Process initialization , interrupts etc.

Section- II

4. An overview of TMS320C6X DSPs : (8)
Introduction, TMS320C6X architecture, functional units, Fetch & Execute packets, pipelining, registers,addressing modes, instruction set, assembly directives, timers, interrupts, Memory considerations, code improvement, constraints.

5. DSP Application I: (6)

FIR/IIR filtering; Fixed point and Floating point implementation using TMS320C54X
Fast Fourier Transform ; Fixed point and Floating point implementation using TMS320C54X

6. DSP Applications II: (6)

FIR/IIR filtering , Adaptive filtering , FFT Analysis, Spectral
Analysis etc. Implementation using TMS320C62X / TMS320C67x.

Reference books:

- Programming with DSP processors – Texas Instruments.
- Digital Signal Processors Architectures, Implementations & Applications – Sen Kuo, Woon-Seng S. Gen . Pearson Publicatios.
- Digital Signal Processors – Venkataramani / Bhaskar.
- Digital Signal Processing and applications with C6713 and C6416 DSK by Rulph Chassaing. A JOHN WILEY & SONS, INC., PUBLICATION
- DSP Processor fundamentals Architectures and Features by Phil Lapsley, Jeff Bier, Amit Shoham . Wiley India.

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Project

Practical: 08 hrs/week **Term Work: 100 marks**
POE: 100 marks

A project group should complete the project and working model of Hardware / Software (as applicable) should be submitted to the Department at the end of semester.

The project group should submit a report based on project work done by them including result analysis of the work done along with synopsis.