SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with "A" Grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.
Phone: 044 - 2450 3150 / 51 / 52 / 54 / 55 Fax: 044 - 2450 2344
www.sathyabama.ac.in

School of Electrical and Electronics Engineering

Minutes of Board of Studies Meeting held on 21st May, 2018

(Venue: Conference Hall, IEC, Sathyabama Institute of Science and Technology, Chennai 119)

Time: 9.00 AM – 11.30 AM

In the beginning of the meeting Dr. N. M. Nandhitha, Dean, School of EEE welcomed all the members and briefed them about the progress of the Department. The BOS members expressed their highly appreciation and satisfaction about the courses and activities of the Department. After that the BOS discussed and resolved the following items:

The Agenda for the meeting was as follows:

- Discussions were held on course structure and course outcomes.
- New & Revised Syllabus
- Inclusion of branch specific and new elective subjects
- Bringing down the overall credits to 180.
- Dr M D Selvaraj. Professor, IIITDM accepted the changes suggested by Dr T.Ravi in the subject 'Programming in HDL'. Dr.Sivakumaran, Prof., NIT, Trichy suggested to include Modeling a test bench, timing and delays , Switch level modeling.
- Dr.S.Lakshmi suggested the change in 'Optical Communication'. Dr.sivakumaran accepted the change.
- The new courses introduced are RF and Microwave Engineering, Data communication and networking, Satellite Communications and Project Work (Phase - II).
- Dr.T.Ravi also presented the new course introduced for PG courses are RTOS Programming, Cloud Computing, High Performance Computing, Advanced Digital Image Processing , Big Data Technologies, RTOS Programming lab.
- The Syllabus Revision carried out in PG courses is VLSI circuit Design for Imaging Applications.
- Dr.Selvaraj suggested specific mentioning should be made in the curriculum with regard to:

a) Program outcomes

b) Program specific outcomes

c) Course objectives

d) Course outcomes

- Dr.Ramadevi suggested the inclusion of Field and HART protocol in 'Logic and Distributed Control system'. Dr.sivakumaran accepted the change.
- Dr.V.Sivachidambaranathan, Prof.& Head, Dept. of Electrical and Electronics Engineering requested Dr.Sundarsingh, Faculty/EEE to present the curriculum revisions before the board for the subject Power System Protection and Switch gear and High Voltage Engineering.
- Dr.V.Sivachidambaranathan, Prof.& Head, Dept. of Electrical and Electronics Engineering requested Dr.Rameshbabu, Faculty/EEE to present the curriculum revisions for the subject Analysis of Inverters before the board.
- They presented the old and new syllabus before the board and discussed the valid additions made in the syllabus.
- Dr.V.Sivachidambaranathan put forth the syllabus of the new courses, 'Industrial Instrumentation and Automation' for the approval of the board. Dr. A.Amalin Prince approved the Syllabus for this new course.

The next BOS meeting may be scheduled on Oct 2018 to review and finalize the syllabus revision process.

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The following internal and external members were present in the meeting.

INTERNAL MEMBERS	SIGNATURE
1. Dr.N.M.Nandhitha	
2. Dr.S.Lakshmi	
3. Dr.V.Vijaya Baskar	
4. Dr.V.Sivachidambaranathan	
5. Dr.T.Ravi	
6. Dr. P. Kavipriya	
7. Dr.P.Chitra	
8. Dr.S.Karthikeyan	
9. Mrs.K.Srilatha	
10. Dr.V.Balamurugan	
11. Mrs.L.Magthelin Therase	
12. Mrs.I.Rexiline Sheeba	
13. Dr.Ramadevi	
14. Mrs.K.Sujatha	
15. Dr.Susitra	

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QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001:2015

External members

Dr.N.Shivakumaran
Professor,
Dept. of I & C
NIT, Trichy

21/5/18

Dr.M.D.Selvaraj,
Associate Professor,
IIITDM, kancheepuram

Selvaraj
21/5/18

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School of Electrical and Electronics Engineering

Minutes of Board of Studies Meeting held on 16st NOV, 2018

Venue: Conference Hall, IEC

Date: 16-11-18

Time: 9.00 AM – 11.30 AM

- Dr. N. M. Nandhitha, Dean, School of EEE welcomed all members of Board of Studies. On the suggestions of various Experts, the contents are designed by the Board of Studies Members considering the various aspects and need of the society. The members appreciated the contents of the syllabus and it was resolved as under:
- Course outcomes for each course has been discussed and modified.
- Dr.T.Ravi put forth the introduction of new courses 'Advanced Microprocessors', 'Automatic Speech recognition', Pattern Recognition and Image Vision' and 'Advanced Electronic Test Engineering'.
- Dr M D Selvaraj. Professor, IIITDM suggested that RF and Microwave Engineering can be renamed as RF Engineering in VIII semester.
- Dr.Sivakumaran, Prof., NIT, Trichy suggested to have Optical Fibre Communication in VII semester can be replaced with visible light communication. Microprocessor Interfacing and its Applications can be modified as Microprocessor and Microcontrollers.
- Dr.Sivakumaran suggested that subject name can be changed from "Control Engineering" to "Modern Control Systems". The members Dr M D Selvaraj advised to revise the fifth unit of Electronic Devices syllabus.
- Dr.T.Ravi also presented the new course introduced for PG courses are AI and Soft Computing, Network Oriented OS, Scada Systems Applications. The Syllabus Revision carried out in PG courses is Computational Nanoelectronics.
- Dr.V.Sivachidambaranathan requested Dr.Susitra to put forth the syllabus of the new courses, 'Testing and Commissioning of Electrical Equipment ' for the approval of the board. Dr. A.Amalin Prince approved the Syllabus for this new course.
- Dr.N.M Nandhitha putforth to revise the syllabus of B.E by incorporating the following

Develop curricula with relevance to:

- Local needs
- National needs
- Regional needs
- Global needs

Develop existing courses with focus on:

- Employability
- Entrepreneurship
- Skill development.
- Note: If any collaboration is made with any organizations to facilitate the courses, MoU's should be signed with them.

Develop existing courses with focus on:

- Gender
- Environment and Sustainability
- Human Values and Professional Ethics.
- Introduce either Field Projects/research projects or Internships at the end of second and fourth semesters.
- New elective courses namely Advanced microprocessor, Automatic Speech recognition, Pattern recognition and image vision, Advanced Electronic Test Engineering has been introduced.
- The Dean reported the members about the efforts of all the members of Board of Studies to prepare the syllabus of the subject B.E for the academic year 2018-19. The next BOS meeting may be scheduled on April 2019 to review and finalize the syllabus revision process. It was resolved as under, "Resolved that the Appreciation of Board of Studies members who contributed to prepare syllabus be noted." There being no other matter, the meeting was concluded with a vote of thanks .

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6. Dr. P. Kavipriya	
7. Dr.P.Chitra	
8. Dr.S.Karthikeyan	
9. Mrs.K.Srilatha	
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13. Dr.Susitra	
14. Dr.R.Ramadevi	
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EXTERNAL MEMBERS

Dr.N.Shivakumaran
Professor
Dept. of I & C
NIT, Trichy

16/11/18

Dr.M.D.Selvaraj,
Associate Professor,
IIITDM, kancheepuram

Selvaraj
16/11/18

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

NEW COURSES

SL.NO	COURSE CODE	COURSENAME
1.	SEC1311	SATELLITE COMMUNICATIONS
2.	S13APROJ2	PROJECT WORK (PHASE - II)
3.	SEC1306	DATA COMMUNICATION AND NETWORKING
4.	SEC1405	RF AND MICROWAVE ENGINEERING
5.	SEC1601	ADVANCED MICROPROCESSORS
6.	SEC1603	AUTOMATIC SPEECH RECOGNITION
7.	SEC1616	PATTERN RECOGNITION AND IMAGE VISION
8.	SEC1617	ADVANCED ELECTRONIC TEST ENGINEERING

SEC1311	SATELLITECOMMUNICATIONS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- This course is to provide
- An in-depth understanding of different concepts used in a satellite communication system.
- Detail description about orbital dynamics, Earth segment, space segments and space links
- Knowledge about link budget calculation and satellite accessing techniques
- An overview of satellite applications and networking of satellites

UNIT 1 INTRODUCTION **9 Hrs.**

Introduction, Types -Active and Passive Satellite, Frequency allocation, types of Satellite orbits, Kepler's laws, Definitions of terms for earth-orbiting satellites, orbital parameters Two line elements, Apogee and Perigee heights, Orbit perturbations, Geo stationary orbit, Antenna look angles, Limits of visibility, Sub satellite point and prediction of satellite position, Earth Eclipse of satellite, Sun transit outage, launching orbits – Launch vehicle - expendable and reusable types.

UNIT 2 THE SPACE SEGMENT AND ANTENNAS **9 Hrs.**

Introduction, The Power supply, Attitude control, Spinning satellite stabilization, Momentum wheel stabilization, Station Keeping, Thermal control, TT&C subsystem, Transponders, The wide band receiver, The input demultiplexer, the power amplifier, the antenna subsystem. The isotropic radiator and antenna gain, horn antenna, parabolic reflector, double reflector- Cassie grain antenna- Gregorian antenna..

UNIT 3 THE EARTH SEGMENT AND THE SPACE LINK **9 Hrs.**

Transmit receive earth station subsystems-up converters-High power Amplifier- Receive chain-LNA & LNB. TVRO Earth station EIRP, Transmission losses, the link budget equation, System noise, Effect of rain, combined uplink and downlink C/N ratio.

UNIT 4 SATELLITE ACCESS AND SATELLITE APPLICATIONS **9 Hrs.**

Multiple access techniques- Concepts and types of TDMA, FDMA and CDMA.DBS, VSAT, Remote sensing, Satellite Mobile services, GPS, INMARSAT, INSAT, Video tele conferencing.

UNIT 5 SATELLITE IN NETWORKING **9 Hrs.**

Satellite digital transmission and on-board switching, PDH & its limitation, SDH: development, standards, SONET, SDH over satellite, ISDN over satellite. Different viewpoints of satellite networking, IP packet encapsulation, Satellite IP networking, IP multicast over satellite, IP multicast routing, IP multicast security, DVB over satellite (DVB-S).

Max. 45 Hrs.

COURSE OUTCOMES: On completion of this course, student will be able to

CO1	Describe the different terminologies used in satellite Communication
CO2	Explain the operation of space segment, Antenna segment and Earth segment
CO3	Apply the corrective & controlling techniques to bring back the satellite in active mode
CO4	Analyze the losses in satellite communication and calculate the link budget equation
CO5	Compare the different multiple access techniques used in satellite communication
CO6	Discuss the applications of satellite in network environment

TEXT / REFERENCE BOOKS

1. Dennis Roddy, "Satellite communication", 4th edition - Tata Mc Graw Hill Co.Special Indian print, 2009.
2. Zhili Sun-John, "Satellite Networking Principles and Protocol", W.& Sons 2005.
3. Timothy pratt & C W. Bostain, "Satellite communication", Wiley 3rd edition 2006.
4. K.N.Raja Rao, "Fundamentals of Satellite communication". PHI 2004

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80 **Exam Duration: 3 Hrs.**

PART A: 10 Questions of 2 marks each-No choice **20 Marks**

PART B: 2 Questions from each unit with internal choice; each carrying 12 marks **80 Marks**

SEC1306	DATA COMMUNICATION AND NETWORKING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- The basic details about the data communication and networking
- A clear understanding of various IEEE networking standards
- An in depth knowledge about the various layers of ISO model data communication system

UNIT 1 DATA COMMUNICATION- BASICS 9 Hrs.

Digital data - digital signals - Bit rate - Bit length - Data rate limits - noise less channels - Noisy channel - Shanon capacity - Performance - Bandwidth - throughput - latency - Bandwidth delay product - jitters. Circuit switched networks - Datagram networks - virtual circuit networks - connection oriented and connection less services - Structure of circuit switches and packet switches - OSI reference model - TCP/IP reference model - comparison of both models.

UNIT 2 NETWORKING 9 Hrs.

Network Topologies - mesh, star, bus, and ring - hybrid topology - Network Standardization - De facto and Dejure standards of networks - ITU - ISO - IETF - NIST - IEEE - Different IEEE802 working groups - internet- Architecture of the internet - Third generation mobile networks - UMTS Architecture - Wired Ethernet - Wireless LANs IEEE 802.11 - RFID - Different types - sensor networks - Multi hop topology of sensor networks.

UNIT 3 PHYSICAL LAYER AND DATALINK LAYER 9 Hrs.

The Physical layer - Media - Twisted pair - coaxial cable - microwave - infrared - millimetre wave - PSTN – The local loop modem - ADSL - Switching - Internet over cable - cable modems The Data link layer - design issues - Error detection and control - data link protocols - HDLC - PPP – IEEE standards for data link layer..

UNIT 4 MAC SUB LAYER AND NETWORK LAYER 9 Hrs.

MAC sub layer for Standard Ethernet, Fast Ethernet, Wireless LAN and broadband wireless. Design issues of network layer - Routing algorithm - shortest path routing - Distance vector routing - Broadcast routing – Congestion control algorithm - Congestion control in virtual circuit and datagram switches - The network layer in the internet - The IP protocol - IP Addresses - Mobile IP - IPv6.

UNIT 5 TRANSPORT LAYER AND APPLICATION LAYER 9 Hrs.

The transport layer - service provided to the upper layer - Elements of transport protocols - Addressing - connection establishment - connection release - UDP – TCP TELNET - E mail - The user agent - Message transfer agent-SMTP - Message access agent: POP and IMAP - File Transfer Protocol - HTTP - SNMP - VOIP.

Max. 45 Hrs.

COURSE OUTCOMES: On completion of this course, student will be able to

CO1	Describe the type of signals to detect and correct single, simple burst errors and switching concepts
CO2	Identify the types of multiplexing and LAN topologies
CO3	Explain the features and characteristics of ISDN & ATM
CO4	Analyze the importance of interconnecting devices and role of protocols in application layer
CO5	Describe the underlying working concepts of a real-time network
CO6	Implement the concept of data communication on application level networking

TEXT / REFERENCE BOOKS

1. Andrew S Tanenbaum “Computer Networks” 5th Edition. Pearson Education/PHI/2011.
2. Behrouz A. Forouzan, “Data Communications and Networking” Fourth Edition, Mc GrawHill HIGHER Education 2007.
3. Michael A.Gallo, William Hancock.M, Brooks/Cole Computer Communications and Networking Technologies,2001
4. Richard Lai and Jirachief pattana, “Communication Protocol Specification and Verification”, Kluwer Publishers, Boston, 1998.
5. Pallapa Venkataram and Sunilkumar S.Manvi, “Communication protocol Engineering”, PHI Learning, 2008

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80 **Exam Duration: 3 Hrs.**

PART A: 10 Questions of 2 marks each – No choice **20 Marks**

PART B: 2 Questions from each unit of internal choice; each carrying 12 marks **60 Marks**

SEC1405	RF AND MICROWAVE ENGINEERING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- Analyze transmission-line circuits at RF and microwave frequencies and Perform Scattering parameter
- analysis of RF networks and microwave systems and assess the impact of microwave component
- performances on overall system performance
- Describe the operation and analyze the performance of basic microwave components and to Design basic
- microwave components
- Analyze Assess qualitatively and quantitatively the role of microwave components in the application areas of
- MIC, MEMS, wireless systems and UWB systems

UNIT 1 MICROWAVE NETWORKS AND COMPONENTS 9 Hrs.

Introduction to microwaves and applications, advantages of microwaves, EM spectrum domain, Review of Low frequency parameters, salient features of S-matrix, salient features of multiport network, losses in microwave circuits, Waveguide corners, bends and twists. Isolator, Circulator- S-matrix of series element in the transmission line, S-matrix for E-plane Tee junction, S-matrix for H-plane Tee junction, S-matrix for magic Tee junction, S-matrix for directional coupler, Strip lines , Micro strip lines and coplanar waveguides.

UNIT 2 MODELLING BIOMEDICAL SYSTEMS 9 Hrs.

Basic properties of dividers and couplers: three port networks, four port networks, The T junction power divider: lossless divider, resistive divider, Wilkinson power divider: unequal power division and n- way Wilkinson power dividers, Quadrature hybrid (90°) coupler, Lange couplers, 180° Hybrid coupler, Even and odd mode analysis of the Wilkinson power divider, the quadrature hybrid, and ring hybrid, Filters design by image parameter and insertion loss method..

UNIT 3 POWER DIVIDERS AND COUPLERS 9 Hrs.

The Brain and its potentials; The Electrophysiology origin of brain waves; the EEG Signal and its characteristics; EEG analysis; Statistical parameter mapping of EEG signal; Linear prediction theory; The autoregressive (AR) method; Wiener filtering problem; Principle of an adaptive filter; Steepest – descent algorithm; Windrow-hoff least –mean-square adaptive algorithm.

UNIT 4 MICROWAVE MEASUREMENTS 9 Hrs.

MICROWAVE TUBES: Klystron, Reflex Klystron, Magnetron - schematic, Principle of operation, performance, characteristics and application. MICROWAVE SOLID STATE DEVICES:PIN, Tunnel, Gunn, IMPATT and TRAPATT diodes, their construction and Principle of operation.

UNIT 5 MICROWAVE AND MILLIMETER WAVE SYSTEMS 9 Hrs.

System aspects of antennas-microwave communication systems-the Friis power transmission formula-Microwave transmitters and receivers-noise characterization of microwave receiver-Frequency multiplexed systems-Radar systems-Millimetre-Wave Radios in Backhaul Networks-The 60 GHz, 70 GHz,80 GHz,90GHz frequency bands and channel sizes, The FCC and NTIA licensing process, Multi GBPS data communication and system requirements.

Max. 45 Hrs.

COURSE OUTCOMES: On completion of this course, student will be able to

CO1	Apply the knowledge of microwave frequencies and the waveguides
CO2	Analyze the operation and working of the various tubes or sources for the transmission of the microwave frequencies
CO3	Analyze the solutions for transmission line problems and impedance matching
CO4	Describe the differences between the conventional tubes and the microwave tubes for the transmission of the EM waves
CO5	Apply the knowledge of microwave measurement techniques to test and Evaluate performance of microwave components
CO6	Design and simulate waveguide components for various microwave applications

TEXT / REFERENCE BOOKS

1. David M. Pozar “Microwave Engineering”, John Wiley & Sons - 3rd Edition, 2009.
2. Samuel Y Liao, “Microwave Devices & Circuits”, Prentice Hall of India, 3rd Edition, 2008.
3. Kulkarni M, "Microwave and Radar Engineering", Umesh Publication, 4th ed,2010..
4. Annapurna Das and Sisir K Das, “Microwave Engineering”, Tata Mc Graw Hill Inc., 2004.
5. M.M.Radmanesh , “RF & Microwave Electronics Illustrated”, Pearson Education, 2007
6. Robert E.Colin, 2ed “Foundations for Microwave Engineering”, McGraw Hill, 2001
7. Reinhold.Ludwig and Pavel Bretshko “RF Circuit Design”, Pearson Education, Inc., 2006

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80 **Exam Duration: 3 Hrs.**

PART A: 10 Questions of 2 marks each – No choice **20 Marks**

PART B: 2 Questions from each unit of internal choice; each carrying 12 marks **60 Marks**

SEC1601	ADVANCED MICROPROCESSORS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To familiarize the fundamental concepts of microprocessor architecture.
- Learn the design aspects of I/O and Memory Interfacing circuits.
- Study about communication and bus interfacing of advanced microprocessors.
- To introduce the concepts of advanced microprocessors.
- To introduce the basic architecture of Pentium family of processors..

UNIT 1 ADVANCED MICROPROCESSOR ARCHITECTURE 9 Hrs.

Internal Microprocessor Architecture - Real mode memory addressing - Protected mode memory addressing - Memory paging - Data addressing modes - Program memory addressing modes - Stack memory addressing modes - Data movement instructions - Program control instructions - Arithmetic and Logic Instructions. Intel 80186 - Architecture.

UNIT 2 INTRODUCTION TO INTEL 80286, 80386 & 80486 9 Hrs.

Introduction to 80286 - Architecture, Real address mode & protected virtual address mode. 80386 Microprocessor - Architecture, Pins & Signals, Memory System Registers, 80386 operating modes – Paging Technique, Protected Mode Operation & Intel 80486 Architecture. Comparison of Microprocessors (8086 - 80286 - 80386 - 80486).

UNIT 3 PENTIUM PROCESSORS 9 Hrs.

Introduction to Pentium Microprocessor - Special Pentium registers - Branch Prediction Logic, Floating Point Module, Cache Structure, and Superscalar Architecture. Pentium memory management - New Pentium Instructions - Pentium Processor -Special Pentium pro features - Pentium 4 processor.

UNIT 4 RISC PROCESSORS I 9 Hrs.

PowerPC-620 - Instruction fetching - Branch Prediction - Fetching - Speculation, Instruction dispatching - dispatch stalls - Instruction Execution - Issue stalls- Execution Parallelism - Instruction completion - Basics of P6 micro architecture - Pipelining - Memory subsystem.

UNIT 5 RISC PROCESSORS II (SUPERSCALAR PROCESSORS) 9 Hrs.

Conversion of Colour Models; Basic of Full-Colour Image Processing; Colour Transformations; Smoothing; Sharpening; Segmentation; Applications of Image Processing - Motion Analysis, Image Fusion, Image Classification.

Max. 45 Hrs.

COURSE OUTCOMES: On completion of this course, student will be able to

CO1	Understand the architecture of advanced microprocessors, addressing modes and control instruction
CO2	Illustrate the architectures and working of 80286,80386 and 80486
CO3	Analyze the Pentium processor and its pro features
CO4	Evaluate the RISC processor I and to use the features pipelining to solve problems
CO5	Implement RISC processor II in real time application
CO6	Develop algorithm/program of the advanced microcontrollers for a particular task

TEXT / REFERENCE BOOKS

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, 2nd Edition, Pearson Education, Inc., 2004
2. Barry B.Brey , “The Intel Microprocessors 8086/8088, 8086, 80286, 80386, 80486, Pentium, Pentium Pro Processor,
3. Pentium II, Pentium III, Pentium 4, Architecture, Programming and interfacing”, Prentice Hall of India Private Limited, New Delhi, 2003
4. Alan Clements, “The Principles of computer Hardware”, Oxford University Press, 3rd Edition, 2003
5. John Paul Shen, Mikko H.Lipasti, “Modern Processor Design”, Tata McGraw Hill, 2006

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80 **Exam Duration: 3 Hrs.**

PART A: 10 Questions of 2 marks each – No choice **20 Marks**

PART B: 2 Questions from each unit of internal choice; each carrying 10 marks 60 **Marks**

SEC1603	AUTOMATIC SPEECH RECOGNITION	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To acquaint the students with the fundamentals of speech signals, Time domain and Frequency domain
- techniques for speech signals and different analysis methods of speech signals and recognition techniques
- On completion of this course the student will recognize
- Acquire knowledge about the fundamentals and digital processing of speech signals.
- Acquire knowledge about the Time domain and Frequency domain techniques for preprocessing of speech signals.
- Acquire knowledge about the different analysis techniques of speech signals.

UNIT 1 FUNDAMENTALS OF SPEECH SIGNAL 9 Hrs.

History of speech recognition research, The Speech Signal: Speech production mechanism, Classification of speech, sounds, nature of speech signal, models of speech production. Speech signal processing: purpose of speech processing, digital models for speech signal, Digital processing of speech signals, Significance, short time analysis.

UNIT 2 TIME DOMAIN METHODS FOR SPEECH PROCESSING 9 Hrs.

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

UNIT 3 FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING 9 Hrs.

Short time Fourier analysis, filter bank analysis, spectrographic analysis, Formant extraction, pitch extraction, Analysis - synthesis systems. Homomorphic Signal Processing.

UNIT 4 SPEECH ANALYSIS AND SPEECH RECOGNITION 9 Hrs.

Cepstral analysis of speech, formant and pitch estimation, Mel frequency cepstrum computation, Applications of speech processing - Speech recognition, Speech synthesis and speaker verification, Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit Recognition System, Continuous digit Recognition System. Vector quantization, speech coding.

UNIT 5 HIDDEN MARKOV MODEL FOR SPEECH RECOGNITION 9 Hrs.

Introduction to Hidden Markov Model (HMM), Types of HMM, Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMs, Adapting to variability in speech (DTW), Language models. Example of speech recognition project.

Max. 45 Hrs.

COURSE OUTCOMES: On completion of this course, student will be able to

CO1	Recognize and acquire knowledge about the fundamentals of speech production
CO2	Understand the application of Time domain analysis in speech signals
CO3	Comprehend the application of Time and frequency domain analysis in speech signals
CO4	Implement the analyses of speech signals in speech recognition applications
CO5	Representation of speech signals using the parametric methods of Hidden Morkov model for speech recognition
CO6	Will be able to develop a speech processing and recognition system using various mathematical models and signal analysis tools

TEXT / REFERENCE BOOKS

1. L. Rabiner and B.-H. Juang, “Fundamentals of Speech Recognition”, Prentice Hall, 1995,ISBN 0-13-015157-2
2. L. R. Rabiner and R. W. Schafer, “Digital Processing of Speech Signals”, Prentice-Hall, 1978, ISBN 0-13-213603-1.
3. J.L Flanagan, “Speech Analysis Synthesis and Perception” - 2nd Edition - Springer Vertag, 1972.
4. I.H.Witten, “Principles of Computer Speech” , Academic press, 1983.
5. Douglas O'Shaughnessy , “Speech Communications: Human & Machine” -, 2nd ed., IEEE Press.
6. Thomas F. Quateri, “Discrete Time Speech Signal Processing: Principles and Practice” - 1st Ed., PE.
7. Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, Wiley

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80 **Exam Duration: 3 Hrs.**

PART A: 10 Questions of 2 marks each – No choice **20 Marks**

PART B: 2 Questions from each unit of internal choice; each carrying 12 marks **60 Marks**

SEC1616	PATTERN RECOGNITION AND IMAGE VISION	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To comprehend the concepts of pattern recognition
- To study the various methodologies of object detection in pattern recognition
- To acquire knowledge about pattern classifications
- To study the various classifiers like fuzzy and neural classifiers
- To understand the concept of image extraction through computer vision and boundary analysis.

UNIT 1 PRINCIPLES OF PATTERN RECOGNITION 9 Hrs.

Patterns and features, training and learning in pattern recognition approach, different types of pattern recognition. Statistical pattern recognition, feature selection, syntactic pattern recognition, clustering and non-supervised learning methods.

UNIT 2 OBJECT DETECTION METHODOLOGIES 9 Hrs.

Combined detection method, edge detection, edge linking, gradient. Laplacian, line detection, method based, point detection, snake methods. Boundary description detection, matching, merges segmentation, smoothing, splitting of boundaries syntactic, analysis of region boundaries, study of shape by region analysis.

UNIT 3 PATTERN CLASSIFICATION 9 Hrs.

Distance Functions - Pattern classification by distance functions - Minimum distance classification - Cluster and cluster seeking algorithms - Pattern classification by likelihood functions. Statistical Functions - Pattern classification using Statistical classifiers - BayesII classifier - Classification performance measures - Risk and error probabilities.

UNIT 4 PATTERN RECOGNITION 9 Hrs.

Fuzzy Classifiers- Fuzzy and crisp classification - Fuzzy clustering - Fuzzy pattern recognition – Syntactic pattern recognition - Selection of primitives - Syntax analysis for pattern recognition. Neural Classifiers - Introduction - Neural network structures for PR, Neural network based pattern associators - Feed forward networks trained by back propagation - ART networks.

UNIT 5 IMAGE EXTRACTION CONCEPTS 9 Hrs.

Introduction of Computer Vision, Computer Imaging System, Image Formation and sensing CVIP tools Software, Image representation. Area Extraction, Concepts, Data-structures, Edge, Line- Linking, Hough transform, Line fitting, Curve fitting.

Introduction - Boundary Analysis and Matching Region Analysis: Region properties, External points, spatial moments, mixed spatial gray-level moments, Boundary analysis- Signature properties, Shape numbers. General Frame Works for Matching, Distance relational approach,.

Max. 45 Hrs.

COURSE OUTCOMES: On completion of this course, student will be able to

CO1	Understand the fundamentals of Pattern Recognition
CO2	Learn the various approaches to identify the patterns
CO3	Implement pattern classification
CO4	Analyze the fuzzy classifiers
CO5	Illustrate the concept of image extraction on computer vision
CO6	Apply the appropriate techniques on the real time application development

TEXT / REFERENCE BOOKS

1. Dude, Hart, and Stock, "Pattern Classification", John Wiley and Sons, 2nd Edition, 2001.
2. Gose, Johnsonbaugh and Jost, "Pattern Recognition and Image Analysis", Prentice Hall; Har/Dsk Edition, 1996.
3. D. Forsyth and J. Ponce , “Computer Vision - A modern approach”, Pearson, 2012.
4. B. K. P. Horn , “Robot Vision”, McGraw-Hill, 1986.
5. Milan Sonka,Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision" , 2007.
6. Robert Haralick and Linda Shapiro, "Computer and Robot Vision", Vol I & II, Addison-Wesley, 1993.
7. Christoper M Bishop, “Neural Network for pattern recognition”, Oxford university press, 2008.B.Razavi ,”RF Microelectronics” , 2nd Edition, Prentice-Hall ,2011.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80 **Exam Duration: 3 Hrs.**

PART A: 10 Questions of 2 marks each – No choice **20 Marks**

PART B: 2 Questions from each unit of internal choice; each carrying 12 marks **60 Marks**

SEC1617	ADVANCED ELECTRONIC TEST ENGINEERING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- The primary goal of the course is to introduce the concepts of automated test engineering techniques applied for testing complex printed circuit board assemblies. On completion of the course the students will learn
- Analog/Digital/Mixed signal devices testing and Functional model development.
- PCBA functional testing methods
- Testing of BGAs/Boundary Scan components in PCBs
- Test pattern generation.

UNIT 1 INTRODUCTION TO PCB TECHNOLOGY 9 Hrs.

Printed Circuit Boards(PCB) - Construction - Types of PCB - Multilayer - Surface Mount technology – PCB Manufacturing process - PCB Inspection methods - Bare Board Testing - Optical and X-Ray Inspection - Electrical tests - Text fixtures - Bed of nails fixtures - Cross talk test - Mock up test - In circuit test – Burn-in-test - Fault diagnostic methods. Electromagnetic compatibility testing of electronic components, subassemblies, Measuring Instruments and systems.

UNIT 2 PCB TROUBLE SHOOTING PROCESS 9 Hrs.

Symptom Recognition - Bracketing Technique - Component failure Analysis - Fault types and causes in circuits - during manufacturing - Manual trouble shooting technique - Tools and Instruments DMM - CRO - PCO - Logic probes - Logic pulsar - Logic Analyzer..

UNIT 3 AUTOMATED TROUBLE SHOOTING TECHNIQUES 9 Hrs.

ATE Techniques - CPU Emulator technique - ROM amd ROM Emulators - In circuit Comparator - In Circuit Functional test - Trouble shooting digital gates - Testing Linear Integrated Circuits - Guarding Technique - VI trace Technique - Bus Cycle Signature System - Board functional test methods - Boundary scan test basics.

UNIT 4 ATE SYSTEM ARCHITECTURE 9 Hrs.

ATE System Components - Digital Pin Electronics - Drive data formats - Digital High way - Analog Highway - Test Vector Generation - Creating test patterns - Fault Simulations.

UNIT 5 DESIGN FOR TESTABILITY (DFT) 9 Hrs.

MDA test systems - Boundary scan test with I/O pin compatibility - Automatic optical inspection systems - Combinational ATE Systems - Design for testability - Observability and Controllability - Testing Flow diagram – Stuck at fault model - Fault simulation - Ad Hoc technique - Scan design technique - Basics of ATPG - BIST-Test pattern generation for built in self test - Exhaustive pattern generation and deterministic testing - Output response Analysis - Transition count syndrome checking - Signature Analysis - Circular BIST.

Max. 45 Hrs.

COURSE OUTCOMES: On completion of this course, student will be able to

CO1	Identify various types of printed circuit boards and effectively use testing tools
CO2	Describe the working of automated test equipments
CO3	Identify faults in assembled PCBs using automated test equipments both at component level and board level
CO4	Design board fixtures to carry out customized board level testing
CO5	Develop test vectors and test patterns for fault identification in custom PCBs
CO6	Design and implement electronic systems with testability architectures

TEXT / REFERENCE BOOKS

1. Michael L.Bushnell et al., "Essentials of Electronic testing for digital, memory and mixed signal VLSI circuit",1st edition, Academic Press, 2002.
2. Randall L Geiger, Pillip E Allen, "VLSI design techniques for analog and digital circuits", MGH,1990.
3. Parag.K.lala, "Digital circuit Testing and Testability", 1st edition, Academic press, 2001.
4. Alfred L.Crouch, "Design for test for Digital ICs and Embedded core systems", 2nd edition, PHI, 1999
5. Sabapathy S.R., "Test Engineering for electronic hardware", Qmax publishers, 1st Edition, 2007.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80 **Exam Duration: 3 Hrs.**

PARTA : 10 Questions of 2 marks each – No choice **20 Marks.**

PART B: 2 Questions from each unit of internal choice; each carrying 12 marks **60 Marks.**