SATHYABAMA UNIVERSITY
(Established under section 3 of UGC Act, 1956)
Declared as Category 'A' University by MHRD, Govt. of India
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai – 600 119, Tamilnadu. India.

School of Electrical and Electronics

DATE: 30-04-2016

VENUE: VLSI LAB

TIME: 10.30 a.m. to 12 noon

Minutes of Board of Studies Meeting held on 30th April, 2016

- Dr.E.Logashanmugam, Faculty Head of EEE at the outset extended his cordial welcome to all the members of the Governing Body and in his introductory remarks, he appreciated the members for their active participation in curriculum revision process. The BOS members expressed their highly appreciation and satisfaction about the courses and activities of the Department. The HODs of ECE, EEE, E&I, E&C and ETCE under the Faculty of Electrical and Electronics, Staff members from the faculty attended the meeting to have an effective interaction with the members as and when required.

- Dr.G.Sundari, Prof. & Head Department of Electronics and Communication started the meeting by welcoming both the external and the internal numbers to the Board of Studies meeting. The guidelines of the syllabus given by the management were explained by HOD to all the members of the BOS. The external members also ratified the decision to revise the syllabus under the mentioned guidelines.

- Dr. M. Madhavi Latha, Professor, JNTU College of Engineering, Hyderabad accepted the changes suggested by Mr.Vino in 'Satellite Communication'.

- Dr,N.M. Nandhitha presented the changes made in the subject ' Programming in MATLAB'. She highlights the added miscellaneous topics- file handling, import & Export – Low Level File I/O – Directory management – FTP File Operations – Time Computations. Dr.Ram Bilas Pachori, Professor, IIT appreciated the effort done by Dr.N.M.Nandhitha.

- Mr.Vino suggested the changes made in 'Digital Logic Circuits' Dr. M. Madhavi Latha accepted the changes. Dr.T.Ravi presented the new course introduced to the students 'Probability Theory and Random process'.

- Dr.T.Ravi also presented the new course introduced for PG courses are Testing of VLSI Circuits, High Speed VLSI design, VLSI for Wireless Communication, ASIC Design, Design of Semiconductor memories and RF circuits Design for M.E. Embedded system. The Syllabus Revision carried out in PG courses is Embedded System Modelling Using UML.

- Dr.R.Ramadevi presentedthe changes made in the process control lab by adding experiment related to fuzzy Logic and Neural Network Application as per the suggestion given by Dr.Sivakumaran.
- Dr.V.Sivachidambaranathan, Prof.& Head, Dept. of Electrical and Electronics Engineering requested Dr.Susitra, Faculty/EEE to present the curriculum revisions before the board.
- She has presented the old and new syllabus for DC machines and transformer (theory and practical) before the board and discussed the valid additions made in the syllabus.
- Dr.V.Sivachidambaranathan put forth the syllabus of the new courses, 'Advanced Power Electronics', 'Electric Vehicles' for the approval of the board. Dr.N Sivakumaran approved the Syllabus for these new courses.

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

INTERNAL MEMBERS	SIGNATURE
1. Dr.E.Logashanmugam	
2. Dr.G.Sundari	
3. Dr.N.M.Nandhitha	
4. Dr.V.Sivachidambaranathan	
5. Dr.V.Vijaya Baskar	
6. Dr.S.Lakshmi	
7. Dr.T.Ravi	
8. Dr.V.G.Sivakumar	
9. Dr. P. Kavipriya	
10. Dr.P.Chitra	
11. Dr.S.Karthikeyan	
12. Ms.K.Srilatha	
13. Dr.R.Ramadevi	
14. Mrs.K.Sujatha	

15. Dr.Susitra

EXTERNAL MEMBERS

Dr. M. Madhavi Latha
Professor, JNTU College of Engineering
Hyderabad

30/4/16

Dr.Ram Bilas Pachori
Professor, IIT Indore

30/4/16

Dr.Sivakumaran,
Professor, NIT, Thiruchirapaali

30/4/16

SATHYABAMA UNIVERSITY
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Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai – 600 119, Tamilnadu. India.

School of Electrical and Electronics

DATE 26-11-2016

VENUE: VLSI LAB

TIME: 10.30 a.m. to 12 noon

Minutes of Board of Studies Meeting

- Dr.E.Logashanmugam, Faculty Head of EEE at the outset extended his cordial welcome to all the members of the Governing Body and in his introductory remarks, he appreciated the members for their active participation in curriculum revision process. The BOS members expressed their highly appreciation and satisfaction about the courses and activities of the Department.
- Dr.G.Sundari, Prof. & Head Department of Electronics and Communication started the meeting by welcoming both the external and the internal numbers to the Board of Studies meeting (26-11-2016, 10.30 a.m. to 12.00 noon).
- The guidelines of the syllabus given by the management were explained by HOD to all the members of the BOS.
- The external members also ratified the decision to revise the syllabus under the mentioned guidelines.
- Dr S Lakshmi, proposed syllabus revision in 'Spread Spectrum Communication'. Dr.M. Madhavi Latha, Professor, JNTU College of Engineering, Hyderabad accepted the changes.
- Dr. M. Madhavi Latha accepted the changes incorporated in the subject' Audio Signal Processing suggested by Dr.P.kavipriya.
- Dr.S.Karthikeyan presented the changes made in 'Analog Communication'. Dr.Ram Bilas Pachori accepted the changes.
- Ms.K.Srilatha presented the changes made in 'Electronic Circuit II'. Dr.Ram Bilas Pachori accepted the changes.
- Dr T Ravi presented the new 'Object Oriented Programming Lab ' for enriching the programming language to students which will be helpful during placement. The two courses introduced are Radar and Navigational Aids' and 'Television Engineering'

- To enrich the knowledge of student with real time industrial environment the five credit course 'Professional Training 1' was introduced to the students was put forth by Dr.G. Sundari.
- Dr.R.Ramadevi suggested few electives for EIE, AsTheory Of Robotics And Automation, Fundamentals of Mechatronics and Instrumentation And Control In Iron And Steel Industries
- Dr.V.Sivachidambaranathan, Prof.& Head, Dept. of Electrical and Electronics Engineering requested Dr.Rameshbabu, Faculty/EEE to present the curriculum revisions before the board.
- He presented the old and new syllabus for AC machines Lab before the board and discussed the valid additions made in the syllabus.

The meeting ended with vote of thanks from the Faculty Head Dr.E.Logashanmugam.

INTERNAL MEMBERS SIGNATURE

1. Dr.E.Logashanmugam
2. Dr.G.Sundari
3. Dr.N.M.Nandhitha
4. Dr.V.Sivachidambaranathan
5. Dr.V.Vijaya Baskar
6. Dr.S.Lakshmi
7. Dr.T.Ravi
8. Dr.V.G.Sivakumar
9. Dr. P. Kavipriya
10. Dr.P.Chitra
11. Dr.S.Karthikeyan
12. Ms.K.Srilatha
13. Dr.R.Ramadevi
14. Mrs.K.Sujatha

15. Dr.Susitra

External members

Dr. M. Madhavi Latha
Professor, JNTU College of Engineering
Hyderabad

Dr.Ram Bilas Pachori
Professor, IIT Indore

Dr.Sivakumaran,
Professor, NIT, Thiruchirappalli

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SYLLABUS REVISION(2016-2017)

SL.NO	COURSE CODE	COURSE NAME
1.	SECX1064	SATELLITE COMMUNICATIONS
2.	SEC1618	PROGRAMMING IN MATLAB
3.	SEC1207	DIGITAL LOGIC CIRCUITS
4.	SECX1067	SPREAD SPECTRUM COMMUNICATION
5.	SECX1057	AUDIO SIGNAL PROCESSING
6.	SEC1209	ANALOG COMMUNICATIONS
7.	SEC1206	ELECTRONIC CIRCUITS - II

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		L	T	P	Credits	Total Marks
SECX1051 (old)	**SATELLITE COMMUNICATION** (Common to ECE, ETCE)	3	0	0	3	100

UNIT 1 INTRODUCTION **10 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.

UNIT 2 THE SPACE SEGMENT & ANTENNAS **10 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 & THE SPACE LINK **10 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 & SATELLITE APPLICATIONS **10 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 INTERNETWORKING WITH TERRESTRIAL NETWORKS AND IP OVER SATELLITE NETWORKS
10 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, DVBoversatellite(DVB-S).

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COURSE OUTCOMES:

On completion of this course, student will be able to

CO1	Analyze the different terminologies used in satellite Communication
CO2	Design 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	Analyze the different multiple access techniques used in satellite communication
CO6	Develop 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
4. K.N.Raja Rao, “Fundamentals of Satellite communication”. PHI 2004

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		L	T	P	Credits	Total Marks
SEC1631 (revised)	**SATELLITE COMMUNICATION** (Common to ECE, ETCE)	**3**	**0**	**0**	**3**	**100**

UNIT 1 INTRODUCTION **10 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.

UNIT 2 THE SPACE SEGMENT & ANTENNAS **10 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 & THE SPACE LINK **10 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 & SATELLITE APPLICATIONS **10 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 DIRECT BROADCAST SATELLITE SERVICES **10 hrs**

Satellite navigation system, Direct Broadcast satellites(DBS),Direct to home broad cast (DTH), Digital audio broadcast (DAB) , World space services , Business TV(BTV), GRAMSAT Case study: Weather Forecasting Satellites: Fundamentals, Images, Orbits, Payloads, Applications.

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COURSE OUTCOMES:

On completion of this course, student will be able to

CO1	Analyze the different terminologies used in satellite Communication
CO2	Analyze 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	Analyze the different multiple access techniques used in satellite communication
CO6	Develop 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
4. K.N.Raja Rao,

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SECX1041	PROGRAMMING IN MATLAB	L	T	P	Credits	Total Marks
		3	0	0	3	100

Course Objectives

1. To understand basic representation of Matrices and vectors in MATLAB
2. To learn various programming structures in MATLAB
3. To study built in and user defined functions in MATLAB.
4. To become conversant with 2D as well as 3D graphics in MATLAB
5. To find solution for complex mathematical problems
6. To explore MATLAB simulink for various engineering systems and applications

UNIT I **10 hrs**

Defining Variables – functions – Matrices and Vectors –Strings – Input and Output statements -Script files – Arrays in Mat lab – Addressing Arrays – Dynamic Array – Cell Array – Structure Array – File input and output – Opening & Closing – Writing & Reading data from files.

UNIT II **10 hrs**

Relational and logical operators – Control statements IF-END, IF-ELSE – END, ELSEIF, SWITCH CASE – FORloop – While loop – Debugging – Applications to Simulation – miscellaneous MAT lab functions & Variables.

UNIT III **10 hrs**

Basic 2D plots – modifying line styles – markers and colors – grids – placing text on a plot – Various / Special Mat Lab 2D plot types – SEMILOGX – SEMILOGY – LOG- LOG – POLAR – COMET – Example frequency response of filter circuits.

UNIT IV **10hrs**

Linear algebraic equations – elementary solution method – matrix method for linear equation – Cramer's method – Statistics, Histogram and probability – normal distribution – random number generation – Interpolation – Analytical solution to differential equations – Numerical methods for differential equations.

UNIT V **10 hrs**

Simulink – Simulink model for a dead zone system, nonlinear system – Applications in DSP – Computation of DFT & FFT – Filter structure –IIR & FIR filter design – Applications in Communication PCM, PCM, DM, DTMF Interfacing of Matlab with event driven simulators.

Course Outcomes

On completion of the course, student will be able to–

CO1	Represent Matrices, vectors and strings in MATLAB, read and write data.
CO2	Classify structures and loops in MATLAB
CO3	Sketch 2D and 3D graphics in MATLAB
CO4	Resolve complex mathematical problems
CO5	Implement MATLAB Simulink for characterizing and analyzing engineering systems and applications

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TEXT / REFERENCE BOOKS:

1. William J.Palm, Introduction to MATLAB 6.0 for Engineers, Mc Graw Hill & Co
2. M.Herniter, Programming in MATLAB, Thomson Learning.
3. John G.Proakis, Digital Signal Processing using MATLAB, Thomson Learning.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

PART A :2 Questions from each unit, each carrying 2 marks. No choice **20Marks**

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

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SEC1618 (Revised)	PROGRAMMING IN MATLAB	L	T	P	Credits	Total Marks
		3	0	0	3	100

Course Objectives

7. To understand basic representation of Matrices and vectors in MATLAB
8. To learn various programming structures in MATLAB
9. To study built in and user defined functions in MATLAB.
10. To become conversant with 2D as well as 3D graphics in MATLAB
11. To find solution for complex mathematical problems
12. To explore MATLAB simulink for various engineering systems and applications

UNIT I INTRODUCTION **9 hrs**

Menus & Tool bars, Variables – Matrices and Vectors- initializing vectors- data types- Functions –user defined functions-passing arguments-writing data to a file-reading data from a file- using functions with vectors and matrices- cell arrays & structures -Strings -2D strings-String comparing- Concatenation – Input and Output statements - Script files

UNIT II LOOPS & CONTROL STATEMENTS **9 hrs**

Introduction; Relational & Logical operations –Example programs-Operator precedence – Control & Decision statements- IF – IF ELSE - NESTED IF ELSE - SWITCH- TRY & CATCH - FOR –WHILE – NESTED FOR- FOR with IF statements, MATLAB program organization, Debugging methods - Error trapping using eval & lastern commands

UNIT III PLOTS IN MATLAB & GUI **9 hrs**

Basic 2D plots – modifying line styles – markers and colors – grids – placing text on a plot – Various / Special Mat Lab 2D plot types – SEMILOGX – SEMILOGY – LOG- LOG – POLAR – COMET – Example frequency response of filter circuits.

UNIT IV MISCELLANEOUS TOPICS **9 hrs**

File & Directory management - Native Data Files-data import & Export – Low Level File I/O – Directory management – FTP File Operations – Time Computations -Date & Time – Format Conversions – Date & Time Functions – Plot labels – Optimization – zero Finding – Minimization in one Dimension - Minimization in Higher Dimensions- Practical Issues. Differentiation & Integration using MATLAB, 1D & 2D Data Interpolation equations.

UNIT V SIMULINK & APPLICATION **9 hrs**

How to create & run Simulink, Simulink Designing- Using SIMULINK Generating an AM signal & 2nd order systems- Designing of FWR & HWR using Simulink-Creating a subsystem in Simulink. Applications Programs- Frequency response of FIR & IIR filters. Open Loop gain of OPAMP, I/P characteristics of BJT, Plotting the graph between Breakdown voltage & Doping Concentration. PCM ,DPCM

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Course Outcomes

On completion of the course, student will be able to–

CO1	Describe the representation of matrices, vectors and strings in MATLAB, operations in files
CO2	Develop MATLAB programs using looping and control statements
CO3	Develop 2D and 3D plots, Graphical User Interface for a given problem
CO4	Develop file management system using MATLAB
CO5	Design Simulink for electronic circuits and communication systems
CO6	Develop MATLAB programming for real time applications

TEXT / REFERENCE BOOKS:

1. Rudra Pratap, "Getting Started with MATLAB 6.0" ,1st Edition, Oxford University Press, 2004
2. Duane Hanselman ,Bruce Littlefield, "Mastering MATLAB 7" , Pearson Education Inc, 2005
3. William J.Palm, "Introduction to MATLAB 6.0 for Engineers", Mc Graw Hill & Co, 2001
4. M.Herniter, "Programming in MATLAB", Thomson Learning, 2001
5. K.K.Sharma, "MATLAB Demystifyied" , , K.K.Sharma, Matlab : Demystified Basic Concepts and Applications, Vikas Publishing House Pvt Ltd, 2010
6. Stephen J. Chapman, " MATLAB Programming for engineers", Thomson, 4th Edition, 2007

END SEMESTER EXAM QUESTION PAPER PATTERN

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

PART A :2 Questions from each unit, each carrying 2 marks. No choice **20Marks**

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

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SECX1002	DIGITAL SYSTEMS	L	T	P	Credits	Total Marks
		3	0	0	3	100

Course Objectives

1. To impart knowledge on Number systems and Boolean algebra.
2. To analyze logic processes and implement logical operations using SOP, POS and Karnaugh map.
3. To understand concepts of sequential circuits and to analyze combinational systems.
4. To understand concepts of sequential circuits and to analyze sequential systems.
5. To analyze the behavior and characteristics of digital logic families and memories.

UNIT I DIGITAL CONCEPTS, NUMBER SYSTEMS, BOOLEAN SWITCHING ALGEBRA 8 hrs

Introduction to Number Systems – Positional Number Systems, Number System conversion, Binary codes – Binary arithmetic, Binary logic functions – Switching algebra – Functionally complete operation sets, Reduction ofswitching equations using Boolean algebra, Realization of switching function.

UNIT II DESIGN OF COMBINATIONAL LOGIC 8 hrs

Minimal two level networks – Minimization of POS and SOP – Design of two level gate networks – Two level NAND-NAND and NOR-NOR networks – Karnaugh maps – Advantages and Limitations – Quine McClusky's method.

UNIT III ARITHMETIC AND STANDARD COMBINATIONAL MODULE AND NETWORKS 10 hrs

Adders – Subtractors – Binary parallel adders, Parallel subtractors, Parallel adder/subtractors, Binary decodersand encoders – Priority encoders – Multiplexers – MUX as universal combinational modules – Demultiplexers – ALUmodule and comparator modules.

UNIT IV SEQUENTIAL CIRCUITS 10 hrs

Flip flops – SR, JK, D and T flip flops, Master – Slave flip flops, Characteristic and excitation table – Shiftregisters – Counters – Synchronous and Asynchronous counters – Modulus counters, Up/Down counters – Statediagram, State table, State minimization, Implication chart method.

UNIT V LOGIC FAMILIES AND MEMORIES (QUALITATIVE STUDY ONLY) 9 hrs

Classification and characteristics of logic family – Bipolar logic family – Saturated logic family – RTL, DTL,DCTL, I2L,TTL, HTL – Non saturated family – Schottky TTL, ECL – Unipolar family – MOS, CMOS – Comparison of logic families – memories – RAM, ROM, PROM, EPROM, EEPROM, SRAM, DRAM, CCD – PAL, PLA – HCT/HCseries IC's

Course Outcomes

On completion of the course, student will be able to

CO1	Memorize procedure of the number conversions, binary codes, binary arithmetic and Boolean laws and theorems.
CO2	Translate the methods of SOP, POS and logic function minimization using Karnaugh map and Tabulation method.
CO3	Apply design procedure of combinational circuits and implementation of combinational logic circuits.
CO4	Analyze the design and implementation of sequential logic circuits.
CO5	Investigate the behavior and characteristics of digital logic families, semiconductor memories and PLDs.

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TEXT / REFERENCE BOOKS:

1. Milos Ercegovac, Jomas Lang, “Introduction to Digital Systems”, Wiley publications, 1998.
2. John M. Yarbrough, “Digital logic: Applications and Design”, Thomas – Vikas Publishing House, 2002.
3. R.P.Jain, “Modern digital Electronics”,3rd Edition, TMH, 2003.
4. William H. Gothmann, “Digital Electronics”, Prentice Hall, 2001.
5. Morris Mano, “Digital design”, 3rd Edition, Prentice Hall of India, 2008.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

PART A: 2 Questions from each unit, each carrying 2 marks. No choice
20Marks

PART B: 2 Questions from each unit with internal choice, each carrying 12 marks
60Marks

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SEC1207 (Revised)	DIGITAL LOGIC CIRCUITS (For ECE, EEE, EIE, ETCE and E&C)	L	T	P	Credits	Total Marks
		3	0	0	3	100

UNIT 1 BOOLEAN ALGEBRA AND LOGIC GATES 9 hrs

Review of number systems - Binary arithmetic – Binary codes – Boolean algebra and theorems - Boolean functions –Minimization of Boolean functions-Sum of Products(SOP)-Product of Sums(POS)-Simplifications of Boolean functions using Karnaugh map and tabulation methods – Logic gates- NAND and NOR implementation

UNIT 2 DESIGN OF COMBINATIONAL CIRCUITS 9 hrs

Introduction to Combinational circuits – Analysis and design procedures – Half Adder, Full Adder- Half Subtractor, Full Subtractor- Parallel binary Adder, Parallel binary Subtractor- Carry look ahead Adder- BCD Adder- Decoders- Encoders-Priority Encoder- Multiplexers- MUX as universal combinational modules- Demultiplexers- Code convertors- Magnitude Comparator

UNIT 3 DESIGN OF SEQUENTIAL CIRCUITS 9 hrs

Introduction to Sequential circuits – Flip flops – SR, JK, D and T flip flops, Master Slave flip flops, Characteristic and excitation table – Realization of one flip flop with other flip flops – Registers – Shift registers – Counters – Synchronous and Asynchronous counters – Modulus counters, Up/Down counters – Ring Counter – Johnson Counter – State diagram, State table, State minimization – Hazards

UNIT 4 DIGITAL LOGIC FAMILIES 9 hrs

Classification and characteristics of logic family – Bipolar logic family – Saturated logic family – RTL, DTL,DCTL, I2L,TTL, HTL – Non saturated family – Schottky TTL, ECL – Unipolar family – MOS, CMOS logic families. Tristate logic Interfacing of CMOS and TTL families. Comparison of logic families

UNIT 5 MEMORIES AND PROGRAMMABLE LOGIC DEVICES 9 hrs

Classification of memories – ROM – ROM organization – PROM – EPROM – EEPROM – RAM – RAM organization – Write operation – Read operation – Memory decoding – Memory expansion – Static RAM – Dynamic RAM – Programmable Logic Devices – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) – Implementation of combinational logic circuits using ROM, PLA, PAL

COURSE OUTCOMES:

On completion of this course, students are able to

CO1	Describe the procedure of Number systems, binary codes , binary arithmetic, Boolean algebra and Logic gates
CO2	Apply the concepts of Combination circuits for their implementation

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CO3	Design the various types of sequential logic circuits
CO4	Analyze the different types of Digital Logic families
CO5	Investigate the behavior and characteristics of digital logic families , PLDs
CO6	Create the structures of SRAM and DRAM

TEXT / REFERENCE BOOKS:

1. Milos Ercegovac, Jomas Lang, “Introduction to Digital Systems”, Wiley publications, 1998
2. John M. Yarbrough, “Digital logic: Applications and Design”, Thomas - Vikas Publishing House, 2002
3. R.P.Jain, “Modern digital Electronics”,3rd Edition, TMH, 2003
4. Morris Mano, “Digital design”, 3rd Edition, Prentice Hall of India, 2008
5. Floyd and Jain, “ Digital fundamentals”, 10th Edition 2009, Pearson Publishers
6. Charles H.Roth. “Fundamentals of Logic Design”, 6th Edition, Thomson Learning, 2013

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SEX1061 old	SPREAD SPECTRUM COMMUNICATION (Common to ECE & ETCE)	L	T	P	Credits	Total Marks
		3	0	0	3	100

UNIT I INTRODUCTION **10 hrs.**

Spread spectrum signal - Spread spectrum digital communication system model -Positive Performance features-Processing gain and other fundamental parameters – Jamming methods - Pseudo Noise sequences-generation of PN codes-PN code properties - Correlation properties - classification of SS.

UNIT II SPREAD SPECTRUM SYSTEMS **10 hrs.**

Spread Spectrum System model - Direct Sequence SS systems - classification of direct sequence spread spectrum systems - Pulse jammer – Partial band jammer – Multitone jammer – Modulation and Demodulation of DSSS-Performance of DSSS in noise and jammer.

UNIT III FREQUENCY HOPPED SPREAD SPECTRUM SYSTEMS **10 hrs.**

Frequency hopped spread spectrum system model with block diagram – Demodulation - Fast hopping versus slow hopping - Advantages and limitations of FHSS systems - Performance of FH/QPSK and FH/DPSK systems in partial band jamming – Time hopping – chirp - Example of SS - Global Positioning System.

UNIT IV SYNCHRONIZATION OF SS SYSTEMS **10 hrs.**

Acquisition and tracking in DS SS – FH SS receivers – Sequential estimation – Matched filter techniques of acquisition and tracking –Delay locked loop – Tau Dither loop - Jamming considerations – Broad band – partial – multitone – repeat back jamming.

UNIT V APPLICATION OF SS SYSTEMS **10 hrs.**

CDMA - multipath channels - FCC part 15 rules - Direct Sequence CDMA –example - IS95 CDMA Digital Spread Spectrum - Satellite communication – Anti jam military communication - Applications in cellular and mobile communications.

COURSE OUTCOMES:

On completion of this course, students are able to

CO1	Explain the features of Direct sequence spread spectrum
CO2	Classify the various jammer systems
CO3	Compare FH/QPSK and FH/DPSK
CO4	Demonstrate BPSK and QPSK
CO5	Describe the Matched Filter techniques
CO6	C Create a simple CDMA based Spread spectrum

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TEXT BOOKS

1. Digital Communication Bernard Sklar , Pearson Education Ltd, second edition, 2007

REFERENCE BOOKS

1. Advanced Digital Communication Systems-NIIT, PHI, st 1edition
2. John Proakis Digital Communication ,TMH, th 4 edition
3. Dixon.R.C, "Spread spectrum systems", John Wiley, 1984.
4. Simon.M.K, J.K.Omura, R.A. Schiltz and B.K.Levitt, "Spread spectrum communication", Vol-I, II & IV, computer science presUsS, A, 1985.
5. Cooperand.G.R, CD.Mc.Gillem, "Modern communications and spread spectrum", McGraw Hill, 1986.

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max Marks : 80	Exam Duration : 3 hrs.
PART A : 2 Questions from each unit, each carrying 2 marks	20 marks
PART B : 2 Questions from each unit with internal choice, each carrying 12 marks	60 marks

Color red indicates the deleted portion. Color yellow indicates the added portion

SEX1061 (Revised)	SPREAD SPECTRUM COMMUNICATION (Common to ECE & ETCE)	L	T	P	Credits	Total Marks
		3	0	0	3	100

UNIT I INTRODUCTION **10 hrs.**

Spread spectrum signal - Spread spectrum digital communication system model-Binary Shift Register Sequences for Spread Spectrum Systems: Introduction, Definitions, Mathematical Background and Sequence Generator Fundamentals, Maximal Length Sequences, Gold Codes.

UNIT II SPREAD SPECTRUM SYSTEMS **10 hrs.**

Spread Spectrum System model - Direct Sequence SS systems - classification of direct sequence spread spectrum systems - Pulse jammer – Partial band jammer – Multitone jammer – Modulation and Demodulation of DSSS-Performance of DSSS in noise and jammer. Performance without coding under AWGN and different jamming environments – spread spectrum systems performances with forward error correction.

UNIT III FREQUENCY HOPPED SPREAD SPECTRUM SYSTEMS **10 hrs.**

Frequency hopped spread spectrum system model with block diagram – Demodulation - Fast hopping versus slow hopping - Advantages and limitations of FHSS systems - Performance of FH/QPSK and FH/DPSK systems in partial band jamming – Time hopping – chirp - Example of SS - Global Positioning System.

UNIT IV SYNCHRONIZATION OF SS SYSTEMS **10 hrs.**

Acquisition and tracking in DS SS – FH SS receivers – Sequential estimation – Matched filter techniques of acquisition and tracking –Delay locked loop – Tau Dither loop - Jamming considerations – Broad band – partial – multitone – repeat back jamming.

UNIT V APPLICATION OF SS SYSTEMS **10 hrs.**

CDMA - multipath channels - FCC part 15 rules - Direct Sequence CDMA –example - IS95 CDMA Digital Spread Spectrum - Satellite communication – Anti jam military communication - Applications in cellular and mobile communications.

COURSE OUTCOMES:

On completion of this course, students are able to

CO1	Explain the features of Direct sequence spread spectrum
CO2	Classify the various jammer systems
CO3	Compare FH/QPSK and FH/DPSK
CO4	Demonstrate BPSK and QPSK
CO5	Describe the Matched Filter techniques
CO6	C Create a simple CDMA based Spread spectrum

Color red indicates the deleted portion. Color yellow indicates the added portion

TEXT BOOKS

1. Digital Communication Bernard Sklar , Pearson Education Ltd, second edition, 2007

REFERENCE BOOKS

1. Advanced Digital Communication Systems-NIIT, PHI, st 1edition
2. John Proakis Digital Communication ,TMH, th 4 edition
3. Dixon.R.C, "Spread spectrum systems", John Wiley, 1984.
4. Simon.M.K, J.K.Omura, R.A. Schiltz and B.K.Levitt, "Spread spectrum communication", Vol-I, II & IV, computer science presUsS, A, 1985.
5. Cooperand.G.R, CD.Mc.Gillem, "Modern communications and spread spectrum", McGraw Hill, 1986.

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max Marks : 80	Exam Duration : 3 hrs.
PART A : 2 Questions from each unit, each carrying 2 marks	20 marks
PART B : 2 Questions from each unit with internal choice, each carrying 12 marks	60 marks

Color red indicates the deleted portion. Color yellow indicates the added portion

		L	T	P	Credits	Total Marks
SECX1057 (old)	**AUDIO SIGNAL PROCESSING**	**3**	**0**	**0**	**3**	**100**

UNIT I SPEECH PRODUCTION
10hrs.
Acoustic theory of speech production (Excitation, Vocal tract model for speech analysis, Formant structure, Pitch). Articulatory Phonetic (Articulation, Voicing, Articulatory model). Acoustic Phonetics (Basic speech units and their classification).

UNIT II SPEECH ANALYSIS
10hrs.
Short-Time Speech Analysis, Time domain analysis (Short time energy, short time zero crossing Rate, ACF). Frequency domain analysis (Filter Banks, STFT, Spectrogram, Formant Estimation &Analysis). Cepstral Analysis

UNIT III PARAMETRIC REPRESENTATION OF SPEECH
10hrs.
AR Model, ARMA model. LPC Analysis (LPC model, Auto correlation method, Covariance method, Levinson-Durbin Algorithm, Lattice form).LSF, LAR, MFCC, Sinusoidal Model, GMM, HMM

UNIT IV SPEECH CODING **10hrs.**
Phase Vocoder, LPC, Sub-band coding, Adaptive Transform Coding , Harmonic Coding, Vector Quantization based Coders, CELP

UNIT V SPEECH PROCESSING
10hrs.
Fundamentals of Speech recognition, Speech segmentation. Text-to-speech conversion, speech enhancement, Speaker Verification, Language Identification, Issues of Voice transmission over internet.

Course Outcomes
On completion of the course, student will be able to–

CO1	Analyze speech production process
CO2	Classify speech analysis process
CO3	Analyze parametric representation of speech
CO4	Design various speech coding techniques
CO5	Implement text to speech and speech enhancement process

TEXT / REFERENCE BOOKS :
1. Speech Communications: Human & Machine by Douglas O'Shaughnessy, IEEE Press, Hardcover 2nd edition, 1999; ISBN: 0780334493.
2. Speech and Audio Signal Processing : Processing and Perception of Speech and Music by Nelson Morgan and Ben Gold, July 1999, John Wiley & Sons,ISBN: 0471351547
3. Digital Processing of Speech Signals, Rabiner and Schafer, Prentice Hall, 1978.
4. Fundamentals of Speech Recognition, Rabiner and Juang, Prentice Hall, 1994.

Color red indicates the deleted portion. Color yellow indicates the added portion

5. Discrete-Time Speech Signal Processing: Principles and Practice by Thomas F. Quatieri Publisher: Prentice Hall; ISBN: 013242942X; 1st edition (October 29, 2001

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max Marks : 80	Exam Duration : 3 hrs.
PART A : 2 Questions from each unit, each carrying 2 marks	20 marks
PART B : 2 Questions from each unit with internal choice, each carrying 12 marks	60 marks

Color red indicates the deleted portion. Color yellow indicates the added portion

		L	T	P	Credits	Total Marks
SECX1057 (revised)	**AUDIO SIGNAL PROCESSING**	**3**	**0**	**0**	**3**	**100**

UNIT I SPEECH PRODUCTION **10hrs.**

Acoustic theory of speech production (Excitation, Vocal tract model for speech analysis, Formant structure, Pitch). Articulatory Phonetic (Articulation, Voicing, Articulatory model). Acoustic Phonetics (Basic speech units and their classification). Classification of Speech sounds – Phones – Phonemes – Phonetic and Phonemic alphabets – Articulatory features. Absolute Threshold of Hearing - Critical Bands- Simultaneous Masking, Masking-Asymmetry, and the Spread of Masking- Non simultaneous Masking - Perceptual Entropy - Basic measuring philosophy -Subjective versus objective perceptual testing - The perceptual audio quality measure (PAQM) - Cognitive effects in judging audio quality.

UNIT II SPEECH ANALYSIS

10hrs. Short-Time Speech Analysis, Time domain analysis (Short time energy, short time zero crossing Rate, ACF). Frequency domain analysis (Filter Banks, STFT, Spectrogram, Formant Estimation &Analysis). Cepstral Analysis

Time domain parameters of Speech signal – Methods for extracting the parameters :Energy, Average Magnitude – Zero crossing Rate – Silence Discrimination using ZCR and energy Short Time Fourier analysis

UNIT III PARAMETRIC REPRESENTATION OF SPEECH

10hrs.

AR Model, ARMA model. LPC Analysis (LPC model, Auto correlation method, Covariance method, Levinson-Durbin Algorithm, Lattice form).LSF, LAR, MFCC, Sinusoidal Model, GMM, HMM Formulation of Linear Prediction problem in Time Domain – Basic Principle – Auto correlation method – Covariance method – Solution of LPC equations

UNIT IV SPEECH CODING **10hrs.**

Phase Vocoder, LPC, Sub-band coding, Adaptive Transform Coding , Harmonic Coding, Vector Quantization based Coders, CELP, Cholesky method – Durbin's Recursive algorithm – lattice formation and solutions – Comparison of different methods – Application of LPC parameters – Pitch detection using LPC parameters – Formant analysis – VELP – CELP.

UNIT V SPEECH PROCESSING **10hrs.**

Fundamentals of Speech recognition, Speech segmentation. Text-to-speech conversion, speech enhancement, Speaker Verification, Language Identification, Issues of Voice transmission over internet.

Color red indicates the deleted portion. Color yellow indicates the added portion

Course Outcomes

On completion of the course, student will be able to–

CO1	Analyze speech production process
CO2	Classify speech analysis process
CO3	Analyze parametric representation of speech
CO4	Design various speech coding techniques
CO5	Implement text to speech and speech enhancement process

TEXT / REFERENCE BOOKS :

1. Speech Communications: Human & Machine by Douglas O'Shaughnessy, IEEE Press, Hardcover 2nd edition, 1999; ISBN: 0780334493.
2. Speech and Audio Signal Processing : Processing and Perception of Speech and Music by Nelson Morgan and Ben Gold, July 1999, John Wiley & Sons,ISBN: 0471351547
3. Digital Processing of Speech Signals, Rabiner and Schafer, Prentice Hall, 1978.
4. Fundamentals of Speech Recognition, Rabiner and Juang, Prentice Hall, 1994.
5. Discrete-Time Speech Signal Processing: Principles and Practice by Thomas F. Quatieri Publisher: Prentice Hall; ISBN: 013242942X; 1st edition (October 29, 2001)
6. Speech Processing and Synthesis Toolboxes by Donald G. Childers, John Wiley & Sons, 2000; ISBN: 0471349593

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max Marks : 80 Exam Duration : 3 hrs.

PART A : 2 Questions from each unit, each carrying 2 marks 20 marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks 60 marks

Color red indicates the deleted portion. Color yellow indicates the added portion

SECX1016 (OLD)	ANALOG COMMUNICATION	L	T	P	Credits	Total Marks
		3	0	0	3	100

Course Objectives

1. To discuss fundamentals of communication system, need of modulation and types of noise.
2. To understand the concepts of Amplitude Modulation and De-Modulation techniques & working of AMtransmitter.
3. To understand the concepts of Frequency Modulation and De-Modulation techniques, working of FM transmitter & Phase Modulation (PM), Relation between FM and PM
4. To understand the concepts of Analog Pulse modulation and De-Modulation techniques (PAM, PDM/PWM and PPM) & Multiplexing techniques and classifications.
5. To discuss the working of Analog Communication Receivers and Systems.

UNIT I BASICS OF ELECTRONIC COMMUNICATION AND NOISE THEORY 10 hrs

Electromagnetic spectrum allocation for various communication systems- Basic communication model - transmitter, receiver and channel – Need for modulation – classification of modulation, Band pass and pass band transmission. Noise definition- Atmospheric Noise, Thermal Noise, Shot noise, partition noise, flicker noise, transit time noise-noise factor, noise factor for cascaded amplifier (Friss formula) –Noise figure – Equivalent noise temperature, signal to noise ratio-noise temperature and bandwidth - Signal to Noise Ratio.

UNIT II AMPLITUDE MODULATION AND DEMODULATION 10 hrs

Mathematical representation – waveform and its spectrum – power – Multi tone and its modulation index – DSB-FC: Collector and base modulation circuits, square law modulator- DSB-SC: Balanced modulator circuit using FET – SSB: Filter method and phase shift method – VSB, Comparison of various AM schemes-AM transmitter: Low level and high level Modulation. Demodulation –Envelope detector, Significance of RC time constant- Square law detector.

UNIT III ANGLE MODULATION AND DEMODULATION 10 hrs

FM-Mathematical representation-waveform and its spectrum – Narrowband and Wideband, Comparison of FM and AM –Phase modulation (PM): Relation between FM and PM- Generation of PM from AM-Indirect method of FM generation (Armstrong method) -Direct method of FM generation (using varactor diode)-Pre emphasis, FM stereo broadcast transmitter.Demodulation of FM-Balanced slope detector- Foster seelay discriminator – Ratio detector – De emphasis.

UNIT IV MULTIPLEXING& ANALOG PULSE MODULATION 10 hrs

Multiplexing- classifications.Analog pulse modulation-Sampling theorem – Nyquist rate – concepts of PAM, PWM, PPM- modulators and demodulators – Noise in pulse modulation.

UNIT V RECEIVERS AND SYSTEMS 10 hrs

AM Receivers-TRF receivers –Super heterodyne receivers: choice of IF, double conversion technique, tracking, AGC-characteristics of receiver — noise in AM receiver. FM Receivers- FM stereo broadcast receivers-AFC-Noise in FM –Capture effect, FM threshold effect. Communication Receivers – Variable Sensitivity and Variable selectivity – Squelch circuit – Beat frequency Oscillator, Telephony – Telegraphy- Television- transmitters and receivers. CCTV concepts and applications- Cable television.

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Course Outcomes

On completion of the course, student will be able to–

CO1	Describe the functional blocks of communication system, noise sources and types
CO2	Derive the mathematical equations and demonstrate the generation & detection of AM, FM, PM, PAM, PDM and PPM
CO3	Design AM and FM transmitters
CO4	ply sampling theorem and demonstrate the significance of various multiplexing techniques
CO5	Analyze the TRF and Super heterodyne receivers and concepts of Telephony,Telegraphy,Television,CCTV and Cable television
CO6	velop appropriate modulation technique for real time applications

TEXT / REFERENCE BOOKS:

1. Wayne Thomasi, "Advanced Electronic Communication Systems", 6th Edition, PHI Publishers,2003.
2. Dennis Reddy and John Coolen, "Electronic Communications", 4th Edition, Prentice Hall Publishers,1995.
3. Kennedy, "Electronic Communications Systems", 4th Edition, McGraw-Hill Publishers,1992.
4. R.PSingh and Sapre,"CommunicationSystems:AnalogandDigital",2ndEdition1995/5thEditionReprint2000, McGraw Hill Publishers

END SEMESTER EXAM QUESTION PAPER PATTERN

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

PART A: 2Questions from each unit, each carrying 2 marks. No choice **20Marks**

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

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SEC1209 (Revised)	ANALOG COMMUNICATIONS	L	T	P	Credits	Total Marks
		3	0	0	3	100

UNIT1 **BASICS OF ELECTRONIC COMMUNICATION AND NOISE THEORY** **9 hrs**

Review of time and frequency domain description of signals - Communication system: point to point and broad cast - Basic model of a communication system: transmitter, receiver and channel - Fundamental limitations: Technological, Physical; Noise, bandwidth (signal and channel) and information capacity - Need for modulation and types - classification of communication based on modulation and channel - Base band and Pass band transmission - Electromagnetic spectrum allocation for various communication systems. Noise in Communication systems: Types and sources of noise; Atmospheric Noise, Thermal Noise, Shot noise, Partition noise, Flicker noise, Transit time noise - noise factor, noise factor for cascaded amplifier (Friss formula) -Noise figure - Equivalent noise temperature and bandwidth - Signal to Noise Ratio

UNIT 2 **AMPLITUDE MODULATION AND DEMODULATION** **9 hrs**

STD-AM (DSB-FC) Mathematical representation - waveform, frequency spectrum, bandwidth, power relations and Modulation index - Multi tone modulation - Limitations and Modifications in STD-AM: DSB-SC, SSB-SC and VSB, AM Generation (Modulators): DSB-FC; square law modulator, Collector and base modulator circuits - DSB- SC; Balanced modulator circuit using BJT/FET - SSB: Phase shift method and Filter method - VSB; Filter method- Application and Comparison of various AM schemes - AM transmitter: Low and high level Modulation. AM Detection (Demodulators) - Envelope detector, Significance of RC time constant - Square law detector - Costa's PLL detector

UNIT 3 **ANGLE (FM & PM) MODULATION AND DEMODULATION** **9 hrs**

Single tone FM: Mathematical representation, waveform, frequency spectrum, modulation index, bandwidth and power - Multi-tone FM - Types and comparison of FM: Narrowband and Wideband - Compare FM and AM Phase modulation (PM): Mathematical representation and waveform - Relation between FM and PM - Conversion: FM to PM and PM to FM - Application of FM and PM. FM Generation: Direct method using Varactor diode and indirect method (Armstrong modulator) - Pre-emphasis - FM stereo broadcast transmitter. FM Detector: Balanced slope detector, Foster seelay frequency discriminator and Ratio detector - De- emphasis

UNIT 4 **ANALOG PULSE MODULATION, DEMODULATION AND MULTIPLEXING** **9 hrs**

Analog pulse modulation - Sampling theorem - Nyquist rate - Concepts of PAM, PWM (PDM) and PPM - Modulators and demodulators. Multiplexing- classifications: Frequency Division Multiplexing, Time Division Multiplexing and Quadrature Multiplexing - Comparison of multiplexing

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UNIT 5 RECEIVERS AND SYSTEMS **9 hrs**

AM Receivers: TRF receivers -Super heterodyne receivers: choice of IF, double conversion technique, tracking, AGC- characteristics of receiver - noise in AM receiver. FM Receivers: FM stereo broadcast receivers - AFC - Noise in FM - Capture effect, FM threshold effect. Communication Receivers: Sensitivity, fidelity and selectivity - Squelch circuit - Beat frequency Oscillator- Overview of Telephony, Telegraphy, Television, CCTV and Cable television

COURSE OUTCOMES:

On completion of this course, students are able to

CO1	Describe the functional blocks of communication system, noise sources and types
CO2	Derive the mathematical equations and demonstrate the generation & detection of AM, FM, PM, PAM, PDM and PPM
CO3	Design AM and FM transmitters
CO4	ply sampling theorem and demonstrate the significance of various multiplexing techniques
CO5	Analyze the TRF and Super heterodyne receivers and concepts of Telephony,Telegraphy,Television,CCTV and Cable television
CO6	velop appropriate modulation technique for real time applications

TEXT / REFERENCE BOOKS:

1. Dennis Roody and John Coolen, Electronic Communication, Pearson, 4/e, 2011

2. Tomasi, Electronic Communications System, Pearson, 5/e, 2011

3. Simon Haykin, —Communication Systems‖, Wiley Publication, New Delhi, 2011

4. Kennedy G, - Electronic Communication systems, Tata McGraw Hill, New Delhi, 2009

5. Sanjay Sharma, “Analog Communication Systems”, 2009

6. B. P. Lathi, Modern digital and analog Communication systems, Oxford University Press., 4th edition, 2010

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 hrs**

Part A: 10 questions of 2 marks each -No choice **20 Marks**

Part B: 5 questions from each unit with internal choice, each carrying 16 marks **80 Marks**

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SECX1028	DIGITALSIGNALPROCESSING	L	T	P	Credits	Total Marks
		3	0	0	3	100

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UNITI DFTANDFFT 10hrs

Review of Time domain and Frequency domain representation of DTLTI system – Discrete random signals Averages – Auto correlation and power spectral density – DFT – Properties – Linear and Circular convolution – FFT–Decimation in time FFT and Decimation in frequency FFT algorithms – Inverse DFT – Applications of FFT to convolution.

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UNITII ANALYSISANDDESIGNOFDIGITALFILTERS 10hrs

Review Butterworth and Chebyshev approximations – Properties of IIR and FIR filters – Design of IIR filter using Impulse invariant and Bilinear transformation method – Design of FIR filter using window method – rectangular, Hanning hamming, Kaiserwindows.

UNITIII EFFECTOFFINITEREGISTERLENGTH 10hrs

Realization structure for FIR & IIR filters – Direct Form I and Direct Form II, cascade, parallel realization – Effect of number representation in registers – fixed point arithmetic – floating point arithmetic –Errors due to rounding – ADC quantization noise – coefficient quantization error – product quantization error – truncation – limit cycles due toproductroundofferror–additionofoverflowerrors–Scaling–dynamicrange.

UNITIVMULTIRATEDIGITALSIGNALPROCESSING 10hrs

Introduction- Concepts of Multirate Signal Processing- Decimation by integer factor- interpolation by integer factor - Sampling rate conversion by non integer factor – multistage approach to sampling rate conversion – Application:echocancellor,efficientdigitaltoanalogConversionincompacthi-fisystems**.**

UNITV DIGITALSIGNALPROCESSORS 10hrs

TMS320C5'412family–Architecture–Addressingmode–Instructionset-Simpleprogram Introduction to code composer studio software – Simulation.

CourseOutcomes:

On completion of the course, student will be able to–

CO1	Classify various types of System representation and the application of transforms.
CO2	Illustrate Digital filter design techniques
CO3	Demonstrate various digital filter realization structures and finite word length effects.
CO4	Describe the concept of multi-rate signal processing and its applications.
CO5	Implement DSP Processor based applications in the field of signal processing.

Color red indicates the deleted portion. Color yellow indicates the added portion

TEXT/REFERENCEBOOKS:

1. SanjitK.Mitra,"DigitalsignalProcessingAComputerBasedApproach",3rdEdition,McGrawHill,2006.
2. J.G.Prokias,"DigitalSignalProcessing",2ndEdition,PrenticeHall,1996.
3. RabinerandGold,"TheoryandapplicationofDigitalSignalProcessing",PrenticeHall,2007.
4. OppenheimandSchafer,"DigitalTimeSignalProcessing",2ndEdition,PrenticeHall,1999.
5. AshokAmbarder,"DigitalSignalProcessing",1stEdition,Cengagelearning,2006.
6. Venkataramani,"DigitalSignalProcessors",TataMcGrawHill,14threprintof2008.
7. JohnGProakisandDimtrisGManolakis,DigitalSignalProcessing,3rdEdition,PHIPearsonEducation,2000.
8. P.RameshBabuetal.,DigitalSignalProcessing,4thEdition,ScitechPublishers,Reprint2010

ENDSEMESTEREXAMQUESTIONPAPERPATTERN

Max.Marks:80 **ExamDuration:3hrs**

PARTA:2Questionsfromeachunit,eachcarrying2marks.Nochoice **20Marks**
PARTB:2Questionsfromeachunitwithinternalchoice,eachcarrying12marks **60Marks**

Color red indicates the deleted portion. Color yellow indicates the added portion

		L	T	P	Credits	Total Marks
SEC1314 (Revised)	DIGITAL SIGNAL PROCESSING	3	1	0	4	100

UNIT 1 INTRODUCTION TO SIGNALS AND SYSTEMS 12hrs

Representation, Characterization and Classifications of Continuous Time (CT) & Discrete Time (DT) signals, Sampling theorem - Aliasing effect, Operations on DT signals , Convolution, Advantages of DSP over ASP , Classification of CT & DT systems , properties of Discrete time systems-Linearity-Time invariance- causality –stability-Linear time Invariant systems, Difference equation representation of LTI systems-The Z transform- properties of Z transform- Inverse Z transform-System transfer Function

UNIT 2 DISCRETE FOURIER TRANSFORM (DFT) AND FAST FOURIER TRANSFORM (FFT) 12hrs

DFT and its properties, Relation between DTFT and DFT, FFT computations using Decimation in time (DIT) algorithms and Decimation in frequency (DIF) algorithms, Auto correlation, Cross correlation, and their properties. Realization of Discrete Time System: introduction, Basic Realization block diagram and the signal flow graph, Realization of recursive and non recursive systems - Direct Form I and Form II - Cascade and parallel realization

UNIT 3 DIGITAL FILTER DESIGN 12 hrs

Design of Digital Filters: General considerations: causality and its implications, characteristics of practical frequency selective filter. Design of FIR filter using window method - Rectangular, Hanning and Hamming Windows. Design of IIR filters using Impulse invariant and Bilinear transformation method. Review of Butterworth and Chebyshev approximations, Frequency selective filters: Ideal filter characteristics, low pass, high pass and band pass filters, Properties of IIR and FIR filters

UNIT 4 FINITE WORD LENGTH EFFECTS 12hrs

Fixed point and floating point number representations - Comparison - Truncation and Rounding errors - Quantization noise - derivation for quantization noise power -coefficient quantization error - Product quantization error - Overflow error - Round off noise power - limit cycle oscillations due to product round off and overflow errors -signal scaling

UNIT 5 MULTIRATE SIGNAL PROCESSING 12hrs

Introduction to Multirate signal processing-Decimation-Interpolation- Poly phase implementation of FIR filters for interpolator and decimator -Multistage implementation of sampling rate conversion-Design of narrow band filters-Applications ofMultirate signal processing, Speech compression, Adaptive filter, Musical sound processing, Image enhancement.

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COURSE OUTCOMES:
On completion of this course, students are able to

CO1	Describe the various types of signals and systems and its operations
CO2	Apply various transforms for different types of signals
CO3	Design IIR & FIR filter using various filter approximations
CO4	Make use of the concept of finite word length effects and its applications in signal processing
CO5	Elaborate the concept of Multirate signal processing
CO6	Explain the perception of Multirate signal processing in real time applications

TEXT / REFERENCE BOOKS:

1. John G. Proakis& Dimitris G.Manolakis, “Digital Signal Processing - Principles, Algorithms & Applications”, Fourth Edition, Pearson education / Prentice Hall, 2009
2. Sanjit K. Mitra , Digital Signal Processing: A Computer - Based Approach, McGraw-Hill Education, 4th dition,2013
3. B.P.Lathi, “Signal Processing & Linear systems”, Oxford University Press, 2nd edition, 2009
4. Lyons, “Understanding Digital Signal Processing”, Prentice Hall, 3rd edition, 2010
5. Johny R. Johnson, “Introduction to Digital Signal Processing”, PHI, 2006
6. Alan V. Oppenheim, Ronald W. Schafer, Discrete-Time Signal Processing, Pearson, 3rd Edition,2010
7. Salivahanan, “Digital Signal Processing, 2nd Edition, TMH, 2010

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 hrs**

Part A: 10 questions of 2 marks each -No choice **20 Marks**
Part B: 5 questions from each unit with internal choice, each carrying 16 marks **80 Marks**

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SECX1007	ANALOG INTEGRATED CIRCUITS	L	T	P	Credits	Total Marks
		3	0	0	3	100

Course Objectives

1. To introduce the concepts of fabrication of Integrated circuit.
2. To study the OP-AMP and its applications.
3. To acquire the knowledge about the filters, oscillators and converters.
4. To study the basic principles of PLL and Timer Circuit
5. To be aware of the concept of Special function ICs

UNITI INTRODUCTIONTOOPERATIONALAMPLIFIERS 10hrs

Introduction to IC fabrication steps- Differential amplifier -Current sources-Building blocks for operational amplifier Monolithic OP-AMP – Ideal operational amplifier– DC and AC Characteristics Input offset voltage- Input bias currentInput offset current- Total output offset voltage- Thermal drift- Slew rate- CMRR - Specifications of typical op-amp(741)—Openloopandclosedloopconfigurations.

UNITII BASICOP-AMPAPPLICATIONS 10hrs

Inverting amplifier- Non-inverting amplifier- Voltage follower- Summing and differential amplifier -Voltage to current – Current to voltage converters- Integrator- Differentiator- Logarithmic and Anti logarithmic amplifiers-Comparator and Schmitt trigger- Frequency response and compensation

UNITIII FILTERSANDOSCILLATORS 10hrs

First order and Second order Butterworth filters- low pass, high pass, band pass and band reject filters -RC phase shift, Wein's bridge oscillator- Astable and Monostable multivibrator-Precision half wave and full wave rectifiers.

UNITIV A/DANDD/ACONVERTERS 10hrs

Sample and Hold circuit– Digital to analog converters: R-2Rladder network and Binary weighted– Characteristics of D/A converters – Analog to digital converters: Flash converter – Successive approximation converter – Dual slope and Oversampling ADCs–Delta Sigma ADC.

UNITV SPECIALFUNCTIONICs 10hrs

Analog Multiplier IC AD 533- Phase Locked Loop IC 565– Block schematic – Lock range and capture range –Applications of PLL: FM demodulator and Frequency synthesizer- VCO IC LM 566 – Timer IC LM 555 and itsapplications:AstableandMonostablemultivibrator–PWMmodulator-PositiveandNegativeVoltageregulators.

Course Outcomes

On completion of the course, student will be able to

CO1	Enhance the knowledge of fabrication steps for integrated circuits
CO2	Design the Active filters using Op- Amp for the given specifications and to describe the concept of CMRR and AC - DC characteristics of operational amplifier.
CO3	Relate the OPAMP for linear and non linear applications including comparators and wave form generators.

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CO4	Design the Active filters using Op- Amp for the given specifications.
CO5	Analyze ADC and DAC for Real time Implementation

TEXT / REFERENCE BOOKS:

1. Grey and Meyer, Analysis and Design of Analog Integrated Circuits, 4th Edition, Wiley International, 2001.
2. Michael Jacob, Applications and Design with Analog Integrated Circuits, 2nd Edition, Prentice Hall of India,1993.
3. RamakantA.Gayakwad, OP-AMP and Linear ICs, 4th Edition, Prentice Hall / Pearson Education, 1994.
4. William D.Stanely, Operational Amplifiers with Linear Integrated Circuits, 4th Edition, Pearson Education, 2004.
5. Sergio Franco, Design with operational amplifiers and analog integrated circuits, 3rd Edition, McGraw-Hill,1997.
6. D.RoyChoudary, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 2000.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

PART A :2 Questions from each unit, each carrying 2 marks. No choice **20Marks**
PART B :2 Questions from each unit with internal choice, each carrying 12 marks **60Marks**

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SEC1302 (Revised)	ANALOG INTEGRATED CIRCUITS	L	T	P	Credits	Total Marks
		3	0	0	3	100

UNIT 1 INTRODUCTION TO OP- AMP AND ITS APPLICATIONS 9 hrs

OP-AMP– DC and AC Characteristics- Input offset voltage- Input bias current-Input offset current- Total output offset voltage- Thermal drift- Slew rate- CMRR -Inverting amplifier- Non-inverting amplifier- Voltage follower- Summing and differential amplifier- Integrator-Differentiator- Logarithmic and Anti logarithmic amplifiers-Comparator and Schmitt trigger

UNIT 2 FILTERS AND SIGNAL GENERATORS 9 hrs

First order and Second order Butterworth filters- low pass, high pass, band pass and band reject filters – RC phase shift, Wein's bridge oscillator- Astable and Monostablemultivibrator-Precision half wave and full wave rectifiers

UNIT 3 A/D AND D/A CONVERTERS 9 hrs

Sample and Hold circuit – Digital to analog converters: R-2R ladder network and Binary weighted – Characteristics of D/A converters – Analog to digital converters: Flash converter – Successive approximation converter – Dual slope ADC.

UNIT 4 PLL AND TIMER CIRCUITS 9 hrs

Phase Locked Loop IC 565– Block schematic – Applications of PLL: FM demodulator and Frequency synthesizer-FSK Demodulator- VCO IC LM 566 – Timer IC LM 555 and its applications: Astable and Monostablemultivibrator

UNIT 5 SPECIAL FUNCTION ICs 9 hrs

Integrated circuit Tuned amplifier, Instrumentation Amplifier, Series and shunt voltage regulator, Opto coupler, CMOS Operational Amplifier- Dc analysis- small signal analysis-specifications of IC MC 14573

COURSE OUTCOMES:

On completion of the course, students are able to

CO1	Interpret the DC-AC Characteristics and applications of Operational Amplifier
CO2	Design the Active filters using OP-AMP
CO3	Develop a voltage controlled oscillator for PLL application
CO4	Examine the applications of special function IC's namely voltage Regulator and 555 timer
CO5	Analyze ADC and DAC for Real time Implementation

Color red indicates the deleted portion. Color yellow indicates the added portion

CO6	Implement a research oriented application using OPAMP

TEXT / REFERENCE BOOKS:

1. D.RoyChoudary, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 2000
2. Grey and Meyer, Analysis and Design of Analog Integrated Circuits, 4th Edition, Wiley International, 2001
3. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 3rd Edition, Tata McGraw-Hill, 2007
4. S. Salivahanan, V.S. KanchanaBhaaskaran, “ Linear integrated circuits”, 3rd Edition, McGraw-Hill, 2011
5. William D.Stanely, Operational Amplifiers with Linear Integrated Circuits, 4th Edition, Pearson Education, 2004
6. D. Choudhari, S. Jain “Linear Integrated Circuits”, New Age International (P) limited, 4th edition, 2010
7. Sedra A. S. and K. C. Smith, Microelectronic Circuits, 6/e, Oxford University Press, 2013

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 hrs**

Part A:10 questions of 2 marks each -No choice **20 Marks**

Part B: 5 questions from each unit with internal choice, each carrying 16 marks **80 Marks**

Color red indicates the deleted portion. Color yellow indicates the added portion

SECX1013	ELECTRONICCIRCUITS II	L	T	P	Credits	Total Marks
		3	0	0	3	100

Course Objectives

1. To analyze the feedback amplifiers.
2. To understand different types of oscillators.
3. To design various types tuned amplifiers.
4. To analyze the performance of RC filters and multivibrators circuits.
5. To evaluate the time base circuits and blocking oscillators.

UNITI FEEDBACKAMPLIFIER 10hrs

Feedback Amplifiers: Types of feedback – effect of feedback amplifier on noise, distortion gain, input and outputimpedance of the amplification, analysis of voltage and current feedback amplifier.

UNITII OSCILLATORS 10hrs

Oscillators: Barkhausen Criterion for Oscillation in Feedback Oscillator – Sinusoidal Oscillator – Phase Shift Oscillator – RC and Wein Bridge Oscillator – Analysis of LC Oscillator, Colpitts, Hartley, Clap, Crystal Oscillator.

UNITIIITUNEDAMPLIFIERS 10hrs

Tuned Amplifiers: Resonance Circuits, Unloaded and Loaded Q of Tank Circuit – Bandwidth – Types of Tuned Amplifiers – Analysis of Single Tuned Amplifier – Double Tuned Amplifier-Stagger Tuned Amplifier – Instability of Tuned Amplifier – Stabilization Techniques, Neutralization and Unilaterlization – Class C Tuned Amplifiers and theirApplication.

UNITIVWAVESHAPINGCIRCUIT 10hrs

Wave Shaping Circuit: High Pass and Low Pass RC Circuits and their Response for Sine, Step, Pulse, Square, Ramp and Exponential Input Multivibrators – Astable Multivibrators – Emitter and Collector Coupled - Monostable, Bistable Multivibrators, and Schmitt Trigger Circuits.

UNITV SWEEPCIRCUITANDBLOCKINGOSCILLATORS 10hrs

Sweep Circuit and Blocking Oscillators: Principle of Time Based Generator – Voltage Time Based Generator – Bootstrapped and Miller Saw Tooth Generator – Current time Based Generator – Monostable and Astable BlockingOscillator using Emitter Based Timing – Push-Pull Operation of Blocking Oscillator.

Course Outcomes

On completion of the course, student will be able to

CO1	Analyze the concepts and characteristics of negative feedback amplifiers
CO2	Design and analyze RC oscillator circuits
CO3	Design and analyze LC & crystal oscillator circuits
CO4	Discuss the operation of Tuned amplifiers
CO5	Create the multivibrators circuits and RC circuits and Understand the operation of blocking oscillators and time base circuits.

Color red indicates the deleted portion. Color yellow indicates the added portion

TEXT / REFERENCE BOOKS:

1. Millman. J And Taub.H, “Pulse, Digital and Switching Waveforms”, TMH, 2000.
2. Mithal G.K, “Electronic Devices and Circuits”, Khanna Publishers, 23rd Edition, 2004.
3. David A. Bell, “Solid State Pulse Circuits”, PHI, 2002.
4. Venkatraman. R, “Pulse, Digital Circuits and Computer Fundamentals”, Dhanpat Rai Publications (P) Ltd., 1986
5. Jacob Millman and C. Halkias, “Integrated Electronics, Analog and Digital Circuits and Systems”, McGraw Hill,1997.

END SEMESTER EXAM QUESTION PAPER PATTERN

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

PART A: 2Questions from each unit, each carrying 2 marks. No choice 20Marks
PART B: 2 Questions from each unit with internal choice, each carrying 12 marks 60Marks

Color red indicates the deleted portion. Color yellow indicates the added portion

Sathyabama Institute of Science and Technology

Department of Electronics and Communication Engineering

SEC1206 (Revised)	ELECTRONIC CIRCUITS - II	L	T	P	Credits	Total Marks
		3	0	0	3	100

UNIT 1 FEEDBACK AMPLIFIERS **9 hrs**

Basic concept of feedback-Types of Feedback - Properties of negative feedback Feedback Topologies - Types of negative feedback connection - effect of negative fe on stability, noise, distortion, gain, input and output impedance, bandwidth- analysis of and current feedback amplifier

UNIT 2 OSCILLATORS **9 hrs**

Condition for Oscillation (Barkhausen Criterion) -Classification of Oscillators -General form of LC Oscillator - Analysis of LC Oscillator, Colpitts, Hartley, Clapp, Armstrong, Crystal Oscillator - Analysis of RC Oscillator, RC Phase Shift Oscillator - Wein Bridge Oscillator

UNIT 3 TUNED AMPLIFIERS **9 hrs**

Resonance Circuits, Unloaded and Loaded Q of Tank Circuit - Bandwidth - Types of Tuned Amplifiers - Analysis of Capacitive coupled and inductive coupled Single Tuned Amplifier - Double Tuned Amplifier-Stagger Tuned Amplifier - Instability of Tuned Amplifier -Stabilization Techniques, Neutralization and Unilaterlization - Class C Tuned Amplifiers

UNIT 4 WAVE SHAPING AND MULTI VIBRATOR CIRCUITS **9 hrs**

High Pass RC, RL Circuits and their Response for Step, Ramp and Exponential signal -Low Pass RC, RL Circuits and their Response for Step, Ramp and Exponential signal -Multivibrators- Collector Coupled Astable, Monostable,BistableMultivibrators and Schmitt Trigger Circuits

UNIT 5 TIME BASE GENERATORS AND BLOCKING OSCILLATORS **9 hrs**

Principle of Time Based Generator - Voltage Time Based Generator -Current time Based Generator- Astable Blocking Oscillator using Emitter Timing -Astable Blocking Oscillator using Base Timing-Monostable Blocking Oscillator using Emitter Timing-Monostable Blocking Oscillator using base Timing

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COURSE OUTCOMES:

On completion of this course, students are able to

CO1	Design the feedback amplifiers
CO2	Design the oscillator circuits
CO3	Design the different types of Tuned amplifiers
CO4	alyze the wave shaping and Multivibrator circuits
CO5	Analyze the blocking oscillators
CO6	Discuss the time base circuits

TEXT / REFERENCE BOOKS:

1. Mithal G.K, “Electronic Devices and Circuits”, Khanna Publishers, 23rd Edition, 2008

2. David A. Bell, “Solid State Pulse Circuits”, PHI, 2008

3. Anil K.Maini and VarshaAgarwal,“Electronic Devices and Circuits “,Wilsey,2009

4.“Electroni Devices and circuits “Jacob Millman and ChriseosC.Halkias Tata McGraw Hill, 2012

5. Sedra and Smith, “Micro Electronic Circuits”; Sixth Edition, Oxford University Press, 2011

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 Exam Duration: 3 hrs

Part A:10 questions of 2 marks each -No choice 20 Marks

Part B: 5 questions from each unit with internal choice, each carrying 16 marks 80 Marks

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