TWO YEAR COURSE STRUCTURE

FOR

M.TECH – DIGITAL ELECTRONICS AND COMMUNICATION SYSTEMS (DECS)

w.e.f.

2017-2018 ADMITTED BATCH

R-17 REGULATIONS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COLLEGE OF ENGINEERING (AUTONOMOUS) :: PULIVENDULA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

PULIVENDULA – 516390, Y.S.R. (DIST), ANDHRA PRADESH, INDIA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) PULIVENDULA – 516 390 (A. P.)

Academic regulations for M. Tech. (Regular) program
with effect from academic year 2017-18

1. ELIGIBILITY FOR ADMISSION:

Admission to the above program shall be made subject to the eligibility, qualification and specialization prescribed by the University for each Program from time to time.

i. Admission shall be made either on the basis of merit/rank obtained by the qualifying candidates in GATE/PGECET or otherwise specified, whichever is relevant.

2. AWARD OF M.TECH. DEGREE:

A student will be declared eligible for the award of the M. Tech. degree if he/she fulfills the following academic regulations:

i. He/she has pursued a course of study for not less than four semesters and not more than eight semesters.
ii. Students, who fail to fulfill all the academic requirements for the award of the degree within eight semesters from the year of their admission, shall forfeit their seat in the course and their seat shall stand cancelled.
iii. Register for 68 credits and secure all 68 credits

3. COURSES OFFERED:

s.no.	Department	Specialization
01.	Electrical & Electronics Engineering (EEE)	*Electrical Power Systems (EPS)*
02.	Mechanical Engineering (ME)	*Computer Aided Design & Computer Aided Manufacturing (CAD&CAM)*
03.	Electronics & Communication Engineering (ECE)	*Digital Electronics & Communication Systems (DECS)*
04.	Computer Science & Engineering (CSE)	*Computer Science & Engineering (CSE)*

And any other course as approved by the competent authorities from time to time.

4. COURSE WORK:

The programs are offered on a Semester basis consisting of four Semesters.

i. The candidates shall undergo ***five theory*** and ***two laboratory*** courses in ***each semester*** during the first and second semesters. During the third and fourth semesters the candidates pursue the dissertation in the concerned specialization only. The theme of dissertation should conform to the specialization.
ii. There shall be one comprehensive online examinations conducted by the respective department one at the end of 1st year with 60 objective questions for 60 marks on the subjects studied in the respective years of both semesters. The heads of the respective department are given the responsibility of preparing question paper and conducting the online examination by maintaining confidentiality. A student shall acquire Two credit assigned to the online examination only when he/she secure 40% or more marks. In case, if a student fails in comprehensive online examination, he shall re- register by following a similar procedure adopted for the lab examinations.

iii. There shall be ***two seminars*** (*seminar-I, and seminar -II*) related to thesis/dissertation. Out of two seminars related to thesis/dissertation, *seminar-I* shall be conducted in the 3rd semester and the *seminar-II* will be in 4th semester.

iv. A candidate has to either present a paper in any national or international conference organized by AICTE recognized college/institution, or, publish a paper in peer-reviewed journals/Conferences proceedings before the submission of thesis.

v. Only on completion of all the prescribed courses, the candidate will be permitted to submit the thesis/dissertation. Three copies of the thesis / dissertation certified by the concerned supervisor in the prescribed form shall be submitted to the College. Once a student fails to submit the thesis within the stipulated period of four semesters, extension of time up to eight semesters may be permitted by the Principal with recommendation of the College Academic Committee.

vi. The Thesis/Dissertation will be adjudicated by one external examiner from reputed institutions/industry appointed by the competent authority.

vii. If the report of the external examiner is favorable, a viva-voce examination shall be conducted by a board consisting of Head of the department as Chairman, the supervisor and the examiner who adjudicated the thesis/ dissertation. The board shall jointly report the candidate's work as:

A - Excellent
B - Good
C - Satisfactory
D - Unsatisfactory

viii. If the report of the viva-voce is not satisfactory, the candidate will retake the viva-voce examination after three months. If he/she fails to get a satisfactory report at the second viva-voce examination, he/she will not be eligible for the award of the degree unless the candidate is asked to revise and resubmit the thesis/dissertation. The resubmitted copy shall be evaluated by the same board.

5. EVALUATION:

The performance of the candidate in each semester program shall be evaluated subject wise, with a maximum of 100 marks for theory and 100 marks for practical examination, on the basis of Internal Evaluation and End Examination.

i. For the theory subjects, 60% of the marks will be for the End Examination and 40% of the marks will be for Internal Evaluation.

Final Internal marks for a total of 40 marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage to the better mid exam and 20% to the other. The two midterm examinations shall be held during the semester, one in the middle of the program and the other one during the last week of instruction. **A student shall answer all three questions in 2 hours of time without seeking any choice**.

The following pattern shall be followed in the End-Examination.

a. Five questions shall be set from each of the five units with either/or type for 12 marks each, and the total marks of 60.
b. All the questions have to be answered compulsorily.
c. Each question may consist of one, two or more bits.

ii. For practical subjects, 60 marks shall be for the End Examinations and 40 marks will be for internal evaluation based on the day to day performance. The end semester practical examination shall be conducted by the concerned laboratory teacher and senior expert in the same subject of the department nominated by the Principal.

iii. Comprehensive Online Examination shall be evaluated for 60 marks ad seminar-I and seminar-II shall be evaluated for internal marks of 50 each. There is no external evaluation for them. A candidate has

to secure a minimum of 50% to be declared successful in all the three evaluations. If the candidate fails, he/she has to re-register for Comprehensive Online Examination /seminars. Assessment of these three shall be done by a board consisting of Head of the Department, concerned thesis supervisors, and senior faculty members of the department.

iv. A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

v. In case the candidate does not secure the minimum aggregate marks as specified in 5 (iv) he/she has to reappear for the semester examination either the supplementary or regular in that subject or repeat the course as and when next offered or do any other specified subject as may be required. *However the candidate is permitted to appear for two courses per semester only*.

6. ATTENDANCE:

A student shall be eligible to appear for end semester examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.

i. Condonation of shortage of attendance up to 10% in any subject i.e. from 65% and above and less than 75% may be given by the College Academic Committee.

ii. **Shortage of Attendance below 65% in aggregate shall in NO case be condoned**.

iii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

iv. Students whose shortage of attendance is not condoned in any semester are not eligible to take their external Examination of that class and their registration shall stand cancelled.

v. A student will not be promoted to the next semester unless he/she satisfies the attendance requirements of the present semester, as applicable. They may seek readmission for that semester as and when offered next.

vi. A stipulated fee shall be payable towards condonation of shortage of attendance to the institution.

7. Grading System is to be introduced. After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

vii. Table – Conversion into Grades and Grade Points assigned

Academic performance	Letter Grade	Grade points Assigned
≥ 95%	S	10
≥90% - < 95%	A++	9.5
≥ 85% - <90%	A+	9
≥80% - <85%	A	8.5
≥75% - <80%	B++	8
≥70% - <75%	B+	7.5
≥65% - <70%	B	7
≥60% - <65%	C++	6.5
≥55% - <60%	C+	6
≥50% - <55%	C	5.5
≥45% -< 50%	D	5
≥40%- < 45%	E	4.5
Below 40%	F(Fail)	0
Absent	Ab (Absent)	0

i. The following procedure shall be adopted to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA);

ii. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$SGPA = \Sigma (C_i \times G_i) / \Sigma C_i$$

Where, Ci is the number of credits of the i^{th} subject and Gi is the grade point scored by the student in the i^{th} course.

ii. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$CGPA = \Sigma (C_i \times S_i) / \Sigma C_i$$

Where 'Si' is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

iv. While computing the GPA/CGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.
Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D, E and F.

8. AWARD OF DEGREE AND CLASS:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he/she shall be placed in one of the following four classes:

Class Awarded	**CGPA Secured**
First Class with Distinction	≥ 7.5
First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 4.0 < 5.5

(The marks in internal evaluation and external Examination shall be shown separately in the marks memorandum)
Further, CGPA to a maximum of extent of 0.05 shall be added which is just sufficient to effect change of class from pass class to Second class, Second class to First class, First class to First class with distinction for all the courses being offered, without adding any marks to the original marks secured by the students
A candidate shall be eligible for the award of respective degree if he/she satisfies the minimum academic requirements in every subject and secures at least satisfactory report on his/her thesis / dissertation and viva-voce.

9. WITHHOLDING OF RESULTS

The result of a candidate shall be withheld if:

i. He/she has not cleared any dues to the Institution / Hostel.
ii. A case of disciplinary action against him/her is pending disposal.

10. TRANSITORY REGULATIONS:

Candidates who have discontinued or have been detained for want of attendance or who have failed after having undergone the course are eligible for re-admission to the same or equivalent subjects as and when subjects are offered, subject to the conditions mentioned in 5-(iv) and 2-(ii).

11. GENERAL:

The academic regulations should be read as a whole for purpose of any interpretation.

i. The college reserves the right of altering the regulations as and when necessary. The regulations altered may be applicable to all the candidates on rolls.

ii. Wherever the word he, him or his occur, it will also includes she, her, hers.

iii. There shall be no place for transfer of candidate within the constituent colleges of Jawaharlal Nehru Technological University during the entire course of the programme.

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JNTUA COLLEGE OF ENGINEERING (Autonomous) PULIVENDULA

Course structure for M.Tech. DIGITAL ELECTRONICS AND COMMUNICATION SYSTEMS (Regular) with effective from 2017-2018

I M.Tech I Semester

S.NO	Course code	Subject Name	Theory	Lab	Credits
1.	17D38101	STRUCTURAL DIGITAL SYSTEM DESIGN	4		4
2.	17D38102	IMAGE AND VIDEO PROCESSING	4		4
3.	17D38103	DIGITAL COMMUNICATION TECHNIQUES	4		4
4.	 17D38104 17D38105 17D38106	**ELECTIVE-I** ADVANCED OPERATING SYSTEMS MOBILE NETWORKS TRANSFORM TECHNIQUES	4		4
5.	 17D38107 17D38108 17D38109	**ELECTIVE-II** NANO ELECTRONICS SECURED COMMUNICATIONS ADAPTIVE SIGNAL PROCESSING	4		4
6.	 17D38110	STRUCTURAL DIGITAL SYSTEM DESIGN LAB		3	2
7.	17D38111	IMAGE & VIDEO PROCESSING LAB		3	2
			20	6	
		CONTACT PERIODS/WEEK		26	
		TOTAL CREDITS (5 THEORY + 2 LABS)			24

I M.Tech II Semester

S.NO	Course code	Subject Name	Theory	Lab	Credits
1.	17D38201	WIRELESS COMMUNICATIONS	4		4
2.	17D38202	DETECTION AND ESTIMATION THEORY	4		4
3.	17D38203	MIXED SIGNAL DESIGN	4		4
4.	17D38204 17D38205 17D38206	**ELECTIVE-III** EMBEDDED SYSTEM DESIGN FUZZY SYSTEMS AND NEURAL NETWORKS WIRELESS SENSOR NETWORKS	4		4
5.	17D38207 17D38208 17D38209	**ELECTIVE-IV** SPEECH PROCESSING INTERNET OF THINGS MULTIMEDIA COMMUNICATIONS	4		4
6.	17D38210	ADVANCED COMMUNICATIONS LAB		3	2
7.	17D38211	MIXED SIGNAL DESIGN LAB		3	2
	17D38212	COMPREHENSIVE ONLINE EXAMINATION			2
	Contact periods/week		20	6	
	Total/week		26		
	Total Credits (5 Theory + 2 Lab +1 online Exam)		26		

II M.Tech I Semester

S.NO	Course Code	Subject	Maximum Marks		Total	Min. Marks/ Grades to Pass	Credits
			Internal	External			
1	17D38301	Seminar-I	50	-	50	25	-

II M.Tech II Semester

S.NO	Course Code	Subject	Maximum Marks		Total	Min. Marks/ Grades to Pass	Credits
			Internal	External			
1	17D38401	Seminar-II	50	-	50	25	-
2	17D38402	**Project Work** Grades : A, B, C, D A - Excellent B - Good C – Satisfactory D - Unsatisfactory	-	-	-	-	18

I M.Tech I Semester

JNTUA COLLEGE OF ENGINEERING (Autonomous) PULIVENDULA

STRUCTURAL DIGITAL SYSTEM DESIGN (17D38101)

L	T	P	C
4	0	0	4

Course Objectives:

1. To study about structural functionality of different Digital blocks (Both combinational and Sequential)
2. To provide an exposure to ASM charts, their notations and their realizations.
3. To provide an exposure to VHDL/Verilog and different styles of modelling using VHDL.
4. To introduce concept of micro programming and study issues related to micro programming

UNIT-I

COMBINATIONAL CIRCUIT BUILDING BLOCKS: Multiplexers, Demultiplexers, Encoders, Decoders, Comparators, Adders, ALU, Carry look Ahead adder.

SEQUENTIAL CIRCUIT BUILDING BLOCKS: Flip-flops, registers, Memory elements, Shift Registers, Sequence Generators, Timing Generators.

UNIT-II

MODELLING WITH HDL:

Introduction to VHDL/Verilog, Modelling Styles in VHDL/Verilog (Data Flow, Behavioral, Structural and Mixed style modeling using HDL).

SYSTEM DESIGN METHODOLOGY:

Finite State Machine, RTL Design, Realization and implementation of Dice Game, Micro Programming, Linked State machines, RTL Implementation Options.

UNIT-III

DESIGN OF COMBINATIONAL LOGIC:

BCD to 7-Segment Display decoder, BCD Adder, Arithmetic and Logic Unit (ALU), State graphs for control circuits, score board and controller, Synchronization and debouncing, A Shift and Add Multiplier, Array Multiplier, Booth Multiplier.

UNIT-IV

DESIGN OF SEQUENTIAL LOGIC:

Design Procedure for sequential circuits, Design Example- code Converter, Design of Iterative circuits, Design of sequential circuits using ROMs and PLAs, sequential circuit design using CPLD, FPGAs, Reduction of state and Flow Tables, Race-Free State Assignment Hazards.

Design Examples: UART, Traffic Light Controller

UNIT-V

HARDWARE TESTING AND DESIGN FOR TESTABILITY: Testing combinational Logic, Testing sequential Logic, Scan Testing, Boundary Scan, Built in Self Test.

Course Outcomes: After Completion of this course students will be able to

a. Understand structural functionality of different digital blocks
b. Represent and Realize their designs in ASM charts
c. Represent their designs in different modelling styles by using VHDL
d. Understand concept of Micro program and issues related to micro programming

TEXT BOOKS:

1. Charles H.Roth Jr, Lizy Kurian John, "Digital System Design Using VHDL," 2nd Edition, Cengage Learning, 2013.
2. Ming-Bio Lin, "Digital System Design and Pratices using Verilog HDL and FPGAs," Willey India Edition, 2012.

REFERENCES:

1. Charles H. Roth, Jr., "Fundamentals of Logic Design", 5th Edition, Cengage Learning, 2012.
2. Z. Kohavi, "Switching & finite Automata Theory," 3rd Edition, Cambridge University Press, 2009.
3. Michael D. Cilleti, "Advanced Digital Design with Verilog HDL", PHI, 2013.

IMAGE AND VIDEO PROCESSING (17D38102)

L	T	P	C
4	0	0	4

Course Objectives:

1. To understand different transforms related to gray scale and color images.
2. To get complete knowledge regarding different techniques associated with Image Enhancement, Image Restoration, Image Segmentation and Image Compression.
3. To get clear knowledge regarding motion estimation, video filtering and video standards

UNIT I

IMAGE FUNDAMENTALS & TRANSFORMS: Gray scale and colour Images, image sampling and quantization. Two dimensional orthogonal transforms: DFT, WHT, Haar transform, KLT, DCT.

UNIT II

IMAGE ENHANCEMENT: Filters in spatial and frequency domains, histogram-based processing, homomorphic filtering. Edge detection, non-parametric and model based approaches, LOG filters, localization problem.

IMAGE RESTORATION: Degradation Models, PSF, circulant and block - circulant matrices, deconvolution, restoration using inverse filtering, Wiener filtering and maximum entropy-based methods.

UNIT III

IMAGE SEGMENTATION: Pixel classification, Bi-level Thresholding, Multi-level Thresholding, P-tile method, Adaptive Thresholding, Spectral & spatial classification, Edge detection, Hough transform, Region growing.

UNIT IV

IMAGE COMPRESSION: Compression models, Information theoretic perspective, Fundamental coding theorem. Huffman Coding, Arithmetic coding, Bit plane coding, Run length coding, Lossy compression: Transform coding, Image compression standards.

UNIT V

VIDEO PROCESSING: Representation of Digital Video, Spatio-temporal sampling, Motion Estimation. Video Filtering, Video Compression, Video coding standards.

Course Outcomes: After completion of this course the students will be able to

a. Different transforms related to gray scale and color images.
b. Complete knowledge regarding different techniques associated with Image Enhancement, Image Restoration, Image Segmentation and Image Compression.
c. Understand basic concepts regarding to motion estimation, video filtering and video standards.

TEXT BOOKS:

1. R. C. Gonzalez, R. E. Woods,"Digital Image Processing", Pearson Education. 2nd edition,2002
2. Bovik, "Handbook of Image & Video Processing", Academic Press, 2000

REFERENCES:

1. Rosenfold and A. C. Kak, "Digital Image Processing," Vols. 1 and 2, Prentice Hall, 1986.
2. H. C. Andrew and B. R. Hunt, "Digital Image Restoration," Prentice Hall, 1977
3. R. Jain, R. Kasturi and B.G. Schunck, "Machine Vision," McGraw-Hill International Edition, 1995

I M.Tech I Semester

DIGITAL COMMUNICATION TECHNIQUES (17D38103)

L	T	P	C
4	0	0	4

Course Objectives:

1. To study about base band signal concepts and different equalizers.
2. To study in detail about coherent detection schemes such as ASK, FSK, PSK
3. To study in detail about M-ary signaling schemes like QPSK, QAM, MSK.

UNIT I

***Review of Random Variables and Random Processes*:** Random variable, Moment generating function, Markov's inequality, Chebyshev's inequality, Central limit theorem, Different distributions – Gaussian, Poisson, Chi square, Rayleigh, Rician; Correlation - Auto-correlation, Cross correlation, Correlation matrix; Stationary processes, Wide sense stationary processes, Gaussian & Ergodic processes, Problem solving.

UNIT II

***Baseband Signal Concepts*:** Baseband data transmission, Nyquist criterion for zero ISI, Correlative level coding, Data Detection, Optimum design of transmit and receive filters, Equalization - Linear, adaptive, fractionally spaced and decision feedback equalizers.

UNIT III

***Digital Modulation Schemes*:** Detection using matched filter – Optimum receivers for arbitrary binary signals and M'ary Orthogonal signals, Analysis of coherent detection schemes for ASK, PSK and DPSK, M'ary signalling schemes – QPSK, QAM, MSK, Performance of the data transmission schemes under AWGN. Trellis coded Modulation.

UNIT IV

***Synchronization*:** Receiver synchronization, costas loop, symbol synchronization, synchronization with CPM – data aided and Non aided synchronization- synchronization methods based on properties of wide sense cyclo-stationary random process – Carrier recovery circuits – Symbol clock estimation schemes.

UNIT V

***Spread Spectrum Systems*:** PN sequences, Generation of PN sequences, DS spread spectrum systems, FH spread spectrum systems and performance of DSSS & FHSS in AWGN – Synchronization – Jamming considerations – Commercial Applications, Cellular subsystems.

Course Outcomes:

a. Students will be aware of base band signal concepts and different equalizers.
b. Students will be able to get complete knowledge regarding coherent detection schemes like ASK, FSK, PSK.
c. Students will be able to design M-ary signaling schemes like QPSK, QAM, MSK

TEXT BOOKS:

1. J.G.Proakis, Digital Communication (4/e), McGraw- Hill, 2001
2. Bernard Sklar, "Digital Communications–Fundamentals & Applications," Prentice Hall, 2001.

REFERENCE BOOKS:

1. R.E.Zimer & R.L.Peterson, "Introduction to Digital Communication", PHI, 2001.
2. G. R. Cooper & C. D. Mc Gillem, "Modern Communications & Spread Spectrum," McGraw Hill, 1986.
3. L.Hanzo et.al, "Turbo Coding, Turbo Equalization & Space-Time Coding," Wiley, 2002.

ADVANCED OPERATING SYSTEMS (17D38104)

L	T	P	C
4	0	0	4

Course Objectives:

1. To Study in detail about kernel structures associated with various Operating systems
2. To Study in detail about various systems calls, statements and their arguments associated with Unix.
3. To Study in detail about various systems calls, statements and their arguments associated with Linux.

UNIT I
INTRODUCTION
General Overview of the System: History – System structure – User perspective – Operating system services – Assumptions about hardware.
Introduction to the Kernel: Architecture of the UNIX operating system – Introduction to system concepts.
The Buffer Cache: Buffer headers – Structure of the buffer pool – Scenarios for retrieval of a buffer – Reading and writing disk blocks – Advantages and disadvantages of the buffer cache.

UNIT II
UNIX I*:* Overview of UNIX system, Structure, files systems, type of file, ordinary & special files, file permissions, Introduction to shell. UNIX basic commands & command arguments, Standard input / output Input / output redirection, filters and editors, System calls related file structures, input / output process creation & termination.

UNIT III
INTERPROCESS COMMUNICATION IN UNIX: Introduction, file and record locking, Client – Server example, pipes, FIFOs, Streams & Messages, Name Speces, Systems V IPC, Message queues, Semaphores, Shared Memory, Sockets & TLI.

UNIT IV
INTRODUCTION TO NETWORKS AND NETWORK PROGRAMMING IN UNIX: Network Primer, TCP/IP, Internet Protocols, Socket Programming, Introduction & overview, UNIX domain protocols, Socket Addresses, Elementary Socket system calls, Simple examples.

UNIT V
LINUX: Introduction to LINUX System, Editors and Utilities, Type of Shells, Shell Operations, File structure, File Management, Operations. Memory Management Policies: Swapping – Demand paging. The I/O Subsystem: Driver Interface – Disk Drivers – Terminal Drivers– Streams – Inter process communication.

Course Outcomes: After completion of the course students will be able to

a. Get complete knowledge regarding different types of operating systems and their Kernel structures.
b. To work effectively on Unix Platform
c. To work effectively on Linux Platform

TEXT BOOKS:

1. Maurice J.Bach, “The design of the UNIX Operating Systems”, PHI
2. Kernighan & Pike, “The UNIX Programming Environment”, PHI

REFERENCES:

1. W.Richard Stevens, “UNIX Network Programming”, PHI, 1998.
2. Richard Peterson, “The Complete reference LINUX”, TMH
3. Ritchie & Yates, “UNIX User Guide”.

MOBILE NETWORKS (17D38105)

L	T	P	C
4	0	0	4

Course Objectives:

1. To study different wireless communication systems
2. To study in detail about different multiples accessing schemes
3. To study about different architectures in mobile networks such as wireless LAN, Hyper LAN and so on
4. To study about dynamic routing and different routing protocols employed in mobile networks

UNIT-I

Wireless communication standards, Cellular communications, GSM protocol architecture,, 3G mobile wireless systems, Beyond 3G

UNIT - II

Multiple Access Techniques - GDMA, TDMA, CDMA, Mobile Data Networks - CDPD, GPRS

UNIT-III

Wireless LAN architecture, physical & MAC layers, Wireless ATM architecture, HIPERLAN, Wireless Personal Area (WPAN) networks - Home RF, Bluetooth.

UNIT-IV

Mobility management in Wireless Networks, Handoff management, Location management, Mobile IP, TCP Wireless Application Protocol

UNIT - V

Mobile Adhoc Networks, Dynamic routing, Route discovery, Routing protocols, Mobile Multimedia Adhoc Networks, MPLS

Course Outcomes: After completion of the course the student will be able to

a. Gain complete knowledge regarding different wireless communication systems.
b. Gain complete knowledge regarding different multiples accessing schemes.
c. Know the architectures of different mobile networks such as wireless LAN , Hyper LAN and so on
d. Know about different routing mechanisms by employing different routing protocols.

TEXT BOOKS:

1. JW Mark **,** W Zhuang, "Wireless communications & Networking", PHI, 2005
2. Kaveh Pahlavan, Prashant Krishnamurthy, "Principles of Wireless Networks", PHI, 2010
3. George Aggelou, "Mobile Adhoc Networks", TMH, 2009.

REFERENCES:

1. William Stallings, "Wireless Communications and Networks", Prentice Hall, 2004.
2. Siva Ram Murthy C. and Manoj B. S., "Ad Hoc Wireless Networks: Architectures and Protocols", 2nd Edition. Pearson Education 2005.
3. Toh C. K., "Ad Hoc Mobile Wireless Networks Protocols and Systems", Prentice Hall, PTR, 2001.
4. Yi-Bing and Imrich Chlamtac, "Wireless and Mobile Networks Architectures", John Wiley & Sons, 2001.

TRANSFORM TECHNIQUES (17D38106)

L	T	P	C
4	0	0	4

Course Objectives:

1. Study of different types of transforms which can be applicable for different types of signals.
2. To study the application of wavelets for different types of signals.
3. To study the applications of Multi rate systems and filter banks.

UNIT I:

REVIEW OF TRANSFORMS: Signal spaces, concept of convergence, Hilbert spaces for energy signals, Orthogonality, Ortho normality, Fourier basis, FT-failure of FT-need for time-frequency analysis, spectrogram plot-phase space plot in time-frequency plane, Continuous FT, DTFT, Discrete Fourier Series and Transforms, Z-Transform.

ADVANCE TRANSFORMS: Relation between CFT-DTFT, DTFT-DFS, DFS-DFT, DCT (1D&2D), Walsh, Hadamard, Haar, Slant, KLT, Hilbert Transforms – definition, properties and applications.

UNIT II:

CWT & MRA: Time-frequency limitations, tiling of time-frequency plane for STFT, Heisenberg uncertainty principle, Short time Fourier Transform (STFT) analysis, short comings of STFT.

NEED FOR WAVELETS: Wavelet Basis- Concept of Scale and its relation with frequency, Continuous time wavelet Transform Equation- Series Expansion using Wavelets- CWT.

UNIT III:

NEED FOR SCALING FUNCTION: Multi resolution analysis, Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat Meyer, Shannon, Daubechies.

SPECIAL TOPICS: Wavelet Packet Transform, Bi-orthogonal basis- B-splines, Lifting Scheme of Wavelet Generation-implementation.

UNIT IV:

MULTIRATE SYSTEMS, FILTER BANKS AND DWT: Basics of Decimation and Interpolation in time & frequency domains, Two-channel Filter bank, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet basis, DWT Filter Banks for Daubechies Wavelet Function.

UNIT V:

APPLICATIONS OF TRANSFORMS: Signal De-noising, Sub-band Coding of Speech and Music, Signal Compression - Use of DCT, DWT, KLT.

Course Outcomes: After completion of the course the student will be able to

a. Use different 1-d and 2-d transforms for different signals.
b. Apply wavelet transforms for different signals and will be able to appreciate its differences with other transformations.
C. Use different advanced transforms such as DCT, DWT and KLT for different applications like signal de noisy, sub band coding of speech and music and signal compression.

TEXT BOOKS:

1. Jaideva C Goswami, Andrew K Chan, “Fundamentals of Wavelets- Theory, Algorithms and Applications”, John Wiley & Sons, Inc, Singapore, 1999.
2. Raghuveer M.Rao and Ajit S. Bopardikar, “Wavelet Transforms-Introduction theory and applications” Pearson edu, Asia, New Delhi, 2003.
3. Soman.K.P, Ramachandran K.I, “Insight into Wavelets from Theory to practice”, Printice Hall India, First Edition, 2004.

REFERENCES:

1. Vetterli M. Kovacevic, “Wavelets and sub-band coding”, PJI, 1995.
2. C. Sydney Burrus, “Introduction to Wavelets and Wavelet Transforms”, 1st Edition, PHI, 1997.
3. Jayaraman, “Digital Image Processing”, TMH, 2009

NANO ELECTRONICS (17D38107)

L	T	P	C
4	0	0	4

Course Objectives:

1. To study about different quantum devices
2. To study in detail about nano devices and nano architectures and their computations
3. To study about Molecular nano Electronics

UNIT – I: Quantum Devices:

Charge and spin in single quantum dots- Coulomb blockade – Electrons in mesoscopic structures - single electron transfer devices (SETs) – Electron spin transistor – resonant tunnel diodes, tunnel FETs - quantum interference transistors (QUITs) - quantum dot cellular automata (QCAs) - quantum bits (qubits).

UNIT – II: Nano Electronic Devices:

Electronic transport in 1, 2 and 3 dimensions- Quantum confinement - energy subbands - Effective mass - Drude conduction - mean free path in 3D - ballistic conduction - phase coherence length - quantized conductance - Buttiker-Landauer formula- electron transport in pn junctions - short channel NanoTransistor –MOSFETs - Advanced MOSFETs - Trigate FETs, FinFETs - CMOS.

UNIT – III: Molecular Nano Electronics:

Electronic and optoelectronic properties of molecular materials - Electrodes & contacts – functions – molecular electronic devices - elementary circuits using organic molecules- Organic materials based rectifying diode switches – TFTs- OLEDs- OTFTs – logic switches.

UNIT – IV: Spintronics:

Spin tunneling devices - Magnetic tunnel junctions- Tunneling spin polarization - Giant tunneling using MgO tunnel barriers - Tunnel-based spin injectors - Spin injection and spin transport in hybrid nanostructures - spin filters -spin diodes - Magnetic tunnel transistor - Memory devices and sensors - ferroelectric random access memory- MRAMS - Field Sensors - Multiferro electric sensors- Spintronic Biosensors.

UNIT – V: Nano Electronic Architectures & Computations:

Architecture Principles: Mono and Multi processor systems – Parallel data processing – Power Dissipation and Parallelism – Classic systolic arrays - Molecular devices-properties - Self-organization – Size dependent - limitations. Computation: Monte Carlo Simulations- Computational methods and Simulations from ab initio to multiscale Modeling- Modeling of Nanodevices.

Course Outcomes: After completion of the course the student will be able to

a. Gain complete knowledge regarding different Quantum Devices.
b. Know about nano devices and nano architectures and their computations.
c. Know about Molecular Nano Electronics

TEXT BOOKS:

1. V. Mitin, V. Kochelap, M. Stroscio, “Introduction to Nanoelectronics,” Cambridge University Press, 2008.
2. Rainer Waser, “Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices,” Wiley-VCH, 2003.

REFERENCES:

1. Karl Goser, Peter Glosekotter, Jan Dienstuhl, “Nanoelectronics and Nanosystems,” Springer, 2004.
2. Sadamichi Maekawa, “Concepts in Spin Electronics,” Oxford University Press, 2006.
3. L. Banyai and S.W.Koch, “Semiconductor Quantum Dots,” World Scientific, 1993.
4. Edward L. Wolf, “Nanophysics and Nanotechnology: An Introduction to Modern Concepts in Nanoscience,” Wiley-VCH, 2006.

SECURED COMMUNICATIONS (17D38108)

L	T	P	C
4	0	0	4

Course Objectives:

1. To study security and different types of attacks.
2. To study about different techniques associated with encryption.
3. To study about different algorithms associated with security.
4. To study about IP security architecture and designing issues related to fire walls.

UNIT-I

Information security, Types of attacks, Info security services - Confidentiality, Integrity, Availability, security process - assessment, Implement security, training

UNIT - II

Security technologies - Firewalls, VPNs ; Encryption - Private Key Encryption, Public key encryption, Key management; Concepts of intrusion detection.

UNIT-III

Message authentications and Hash functions, Digital signatures, e-mail security, IP security architecture, Web security

UNIT-IV

Authentication and authorization in WLANs -802.1X authentication, RADIUS protocol; Extensible Authentication protocol, Transport Layer Security and certificates

UNIT - V

Data protection in WLANs - WEP, 802.11i security, RSNA, CCMP, TKIP, wireless roaming security, WMAN security.

Course Outcomes: After completion of this course students will be able to know

a. The need and role of security.
b. Gain knowledge about different techniques associated with encryption.
c. Functioning of different algorithms associated with security.
d. Gain knowledge regarding IP security architecture and designing issues related to fire walls.

TEXT BOOKS:

1. Eric Maiwald**, "**Fundamental of Network Security", Dreamtech press Osborne MGH, 2004
2. W. Stallings, "Cryptography & Network Security", 3/e, PHI 2003
3. Thomas Hardjono , RD Lakshminath**, "**Security in Wireless LAN & MAN", Artech House, 2005

REFERENCES:

1. Roger J. Sutton, "Secure Communications: Applications and Management", WILEY,2002.
2. Don J. Torrieri, "Principles of secure communication systems", 2nd Eedition, ArtechHouse Publishers, 1992.
3. Cryptography and secure Communications by M.Y. Rhee, Mc Graw Hill

ADAPTIVE SIGNAL PROCESSING (17D38109)

L T P C
4 0 0 4

Course Objectives:

1. To study in detail about adaptive Systems.
2. To study about various Linear optimum filtering techniques.
3. To study about various techniques related Linear and Non Linear adaptive filtering.

UNIT I:

Introduction to Adaptive Systems: *Eigen Analysis* - Eigen Value problem, Properties of eigen values and eigen vectors, Eigen filters, Eigen value computations, *Adaptive Systems* - Definitions, Characteristics, Applications and Examples of Adaptive systems, The adaptive linear combiner – Description, weight vectors, Desired response performance function, Gradient and Mean square error(MSE).

UNIT II:

Linear Optimum Filtering: *Wiener Filters* – Linear optimum filtering, Principle of Orthogonality, Wiener-Hopf equations, Error performance surface, Channel Equalization, Linearly constrained minimum variance filter, *Linear Prediction* – Forward and Backward linear prediction, Levinson-Durbin Algorithm, Properties of prediction error filters, AR modeling of stationary stochastic process, Lattice predictors, Joint process estimation, *Kalman Filters* - Recursive mean square estimation for scalar random variables, Kalman filtering problem, The innovations process, Estimation of the state using innovations process, Filtering, Initial conditions, Variants of the Kalman filter, Extended Kalman filter, Problem Solving.

UNIT III:

Linear Adaptive Filtering-I: Method of Steepest descent algorithm and its stability, *Least Means Square (LMS) algorithm* – Structure & operation of LMS algorithm, Examples, Stability & performance analysis of the LMS algorithm, Simulations of Adaptive equalization using LMS algorithm, Convergence aspects, *Method of Least Squares (LS)* - Statement, Data windowing, Minimum sum of error squares, Normal equations and linear least squares filters, Properties.

UNIT IV

Linear Adaptive Filtering-II *Recursive Least Squares (RLS) Algorithm* – Matrix inversion lemma, The exponentially weighted RLS algorithm, Update recursion for the sum of weighted error squares, Example, Convergence Analysis, Simulation of adaptive equalization using RLS algorithm, *Order Recursive Adaptive Filters* – Adaptive forward and backward linear prediction, Least squares Lattice predictor, QR-Decomposition based Least squares Lattice filters & their properties, Simulation of Adaptive equalization using Lattice Filter.

UNIT V:

Non linear Adaptive Filtering: *Blind deconvolution* – Theoretical and practical considerations, Bussgang algorithm for blind equalization for real base band channels, Special cases of Bussgang algorithm, Simulation studies of Bussgang algorithms, Problem solving.

***Course Outcomes*:** After the course students is expected to be able to:

a. Get complete knowledge regarding adaptive systems
b. Design various Linear optimum filters by employing different techniques associated with them
c. Understand various techniques related to with Linear and Non linear adaptive filtering and their design considerations

TEXT BOOKS:

1. Simon Haykin, "Adaptive Filter Theory," Prentice Hall, 4th Edition, 2002.
2. Bernard Widrow, Samuel D. Strearns, "Adaptive Signal Processing," Prentice Hall, 2005.

REFERENCES:

1. Paulo S.R. Diniz, Adaptive Filtering Algorithms and Practical Implementation, Third Edition,Springer, Kluwer Academic Publishers.
2. Alexander D Poularikas, Zayed M Ramadan, Adaptive Filtering Primer with MATLAB, CRC Press Taylor & Francis Group, 2008 Indian Edition.
3. Ali H. Sayed, Adaptive filters, IEEE Press, Wiley-Interscience, A john Wiley & Sons, INC.,Publication.
4. S. Thomas Alexander, "Adaptive Signal Processing-Theory & Applications," Springer –Verlag, 1986

I M.Tech I Semester

STRUCTURAL DIGITAL SYSTEM DESIGN LAB (17D38110)

L	T	P	C
0	0	3	2

Objectives:

1. To understand about VHDL and Verilog Programming in all available styles.
2. To understand differences between Verilog and VHDL.
3. To represent the different digital blocks in Verilog and VHDL in all available styles of modeling

Using VHDL and Verilog do the following experiments

1. Design of 4-bit adder
2. Design of Booth Multiplier
3. Design of 4 bit / 32 Bit ALU
4. Design of Counters & Shift Registers
5. Design of MIPS Processor
6. Fire Detection and Control System using Combinational Logic circuits.
7. Traffic Light Controller using Sequential Logic circuits
8. Pattern Detection using Moore Machine.
9. Finite State Machine(FSM) based logic circuit.

Mini Project

Learning Out Comes: After completion of this course the students will be able to understand

a. Different modeling styles available in VHDL and Verilog and difference between them
b. Difference between Verilog and VHDL
c. Representation of different digital modules in different modeling styles available in VHDL and Verilog

I M.Tech I Semester

IMAGE & VIDEO PROCESSING LAB (17D38111)

L	T	P	C
0	0	3	2

Course Objectives:

1. To read, write and perform various operations on different types of images and videos.
2. To simulate various enhancement, segmentation, compression and various morphological operation on images.
3. To simulate spatio-temporal sampling, motion estimation, filtering and various compression techniques on various types of videos.

List of Experiments:

The students are required to simulate the following experimental parts on the MATLAB environment by considering the relevant application based examples.

PART-A: Image Processing

1. Image Enhancement.
2. Enhancement in Frequency Domain.
3. Image Segmentation.
4. Image Compression.
5. Morphological Operations.

PART-B: Video Processing

1. Representation of Digital video: Read, Write, View Videos and conversion of videos in different formats.
2. Spatio-temporal sampling of Videos
3. Video motion estimation
4. Videos filtering.
5. Video Compression.

Tools Required: MATLAB – 7.0 & above

Course Outcomes:

After completion of this course the students will be able to

a. Enable to develop knowledge and understating and technical skills in Image & Video Processing systems and relevant areas of engineering.
b. Simulate various operations on images and videos using different algorithms.
c. Provides experience of analytical and imaging and video techniques relevant for various applications.

WIRELESS COMMUNICATIONS (17D38201)

L	T	P	C
4	0	0	4

Course Objectives:

1. To understand basics of Wireless Communications and its evolution process.
2. To learn about the mechanism of radio mobile propagation and its effects.
3. To understand various types of diversity and equalization techniques to counter balance the effects of Wireless Channel.
4. To Study about importance of Wireless Networking and multiple access techniques in the present day mobile communications
5. To design and analyze mobile systems using OFDM technology for mitigating the ISI effects at higher data rates.

UNIT – 1

Introduction to Wireless Communication Systems & Cellular Concept:
Evolution of Mobile Radio Communication Systems, Examples of Wireless Communication Systems, 1G, 2G, 2.5G, and 3G Wireless Cellular Networks and Standards, Frequency Reuse Concept, Channel Assignment Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems, Problem Solving.

UNIT - 2

Mobile Radio Propagation:
Large Scale Path Loss: Introduction, Free Space Propagation Model, *Propagation Mechanisms* – Reflection, Diffraction, and Scattering, Practical Budget Design using Path Loss Models, Outdoor Propagation Models, Indoor Propagation Models.
Small Scale Fading and Multipath: Small Scale Multipath Propagation, Impulse Response Model of a Multipath Channel, Small Scale Multipath Measurements, Parameters of Mobile Channels, Types of Small Scale Fading (all variations*), Statistical Models* – Clarke's Model for Flat Fading, Jake's Model, Level Crossing Rate, Simulation of Clarke's/Jake's Model, Two Ray Rayleigh Fading Model, Problem Solving.

UNIT -3

Equalization & Diversity Techniques:
Equalization: Survey of Equalization Techniques, Linear and Non-linear Equalizers – Linear Transversal Equalizer, Decision Feedback Equalizer (DFE), Algorithms for Adaptive Equalization – Zero Forcing, LMS, RLS, Fractionally Spaced Equalizers.
Diversity Techniques: Realization of Independent Fading Paths, *Receiver Diversity* – System Model, Selection Combining, Threshold Combining, Maximal Ratio Combining, Rake receiver, Equal Gain Combining, *Transmit Diversity*–Channel known at Transmitter, Channel unknown at Transmitter – the Alamouti Scheme, analysis.

UNIT - 4

Multiple Access Techniques & Networking:
Introduction to Multiple Access: FDMA, TDMA, CDMA, SDMA, Packet Radio, Capacity of Cellular Systems, Problem Solving.
Introduction to Wireless Networking: Introduction to Wireless Networks, Differences between Wireless and Fixed Telephone Networks, Development of Wireless Networks, Traffic Routing in Wireless Networks, Wireless Data Services, Common Channel Signaling.

UNIT - 5

Multicarrier Modulation:
Data Transmission using Multiple Carriers, Multicarrier Modulation with Overlapping Subchannels, Discrete Implementation of Multicarrier Modulation, The Cyclic Prefix, Orthogonal Frequency Division Multiplexing (OFDM), Matrix Representation of OFDM, Vector Coding, Challenges in Multicarrier Systems, Problem Solving.

***Course Outcomes**:* After completion of this course the students will be able to

a. Understand basics of Wireless Communications and its evolution process.
b. Know about the mechanism of radio mobile propagation and its effects.
c. Apply various types of diversity and equalization techniques to counter balance the effects of Wireless Channel.
d. Recognize the importance of Wireless Networking and multiple access techniques in the present day mobile communications
e. Analyze and design mobile systems using OFDM technology for mitigating the ISI effects at higher data rates.

TEXT BOOKS:

1. Aditya K Jagannatham, "Principles of Modern Wireless Communications Systems," 1st Edition, McGraw Hill, 2015.
2. T. S. Rappaport, "Wireless Communications, Principles and Practice," Prentice Hall, 2nd Edition, 2002.

REFERENCES:

1. Andrea Goldsmith, "Wireless Communications," Cambridge University Press, 2005.
2. David Tse, PramodViswanath, "Fundamentals of Wireless Communications," Cambridge University Press, 2006.
3. Dr. KamiloFeher, "Wireless Digital Communications," Prentice Hall, 1995.

I M.Tech II Semester

DETECTION AND ESTIMATION THEORY (17D38202)

L	T	P	C
4	0	0	4

Course Objectives:

1. To provide knowledge about various estimation, and detection techniques.
2. To analyze different methods & to detect and estimate the signal from noisy signal.
3. Estimate and detect the signals in the presence of noise.

UNIT - I

Introduction to Estimation and Detection:

Introduction, Detection and Estimation in Signal Processing, the Mathematical Detection& Estimation problem, Assessing Estimator Performance, Hierarchy of detection problems, Role of asymptotics.

Estimation

UNIT - II

Minimum Variance Unbiased Estimation:

Unbiased Estimators, Minimum Variance Criterion, Existence of the minimum Variance Unbiased Estimator, Finding the Minimum Variance Unbiased Estimator,

Cramer-Rao Lower Bound - Estimator of Accuracy Considerations, Cramer-Rao Lower Bound (CRLB), General CRLB for Signals in White Gaussian Noise, Transformation of Parameters, Extension to a Vector Paramter, Vector Parameter CRLB for Transformations, CRLB for the general Gaussian case,

Linear Models -Definition and Properties, Linear Model Examples, Extension to the Linear Model,

General Minimum Variance Unbiased Estimation: Introduction, Sufficient Statistics, Finding Sufficient Statistics.

UNIT - III

Best Linear Unbiased Estimators:

Definition of BLUE, Finding the BLUE, Extension to Vector Parameter,

Estimation Methods - Maximum Likelihood Estimation (MLE), Finding MLE, Properties of MLE, MLE for Transformed Parameters, Numerical Determination of the MLE, Extension to a Vector Parameter, The Least Squares Approach, Linear Least Squares, Method of Moments, Extension to a Vector Parameter, Statistical Evaluation of Estimators.

The Basian Philosophy - Prior Knowledge and Estimation, Choosing a Prior PDF, Properties of Gaussian PDF, Basian Linear Model, Minimum Mean Square Error (MMSE) Estimators, Maximum A Posteriori Estimators, Performance Description, Linear Basian Estimators – Introduction, Linear MMSE Estimation, Geometrical Interpretations, The Vector LMMSE Estimator.

Detection

UNIT - IV

Statistical Decision Theory I:

Introduction, Neyman-Pearson Theorem, Receiver Operating Characteristics, Minimum Probability of Error, Bayes Risk, Multiple Hypothesis Testing,

Deterministic Signals - Matched Filters, Development of Detector, Performance of Matched Filter, Performance of Generalized Matched Filters, Multiple Signals – Binary Case and its performance, M-ary Case, Linear Model, **Random Signals**– Estimator Correlator, Linear Model.

UNIT - V

Statistical Decision Theory II:

Introduction, Summary of Composite Hypothesis, Composite Hypothesis Testing (CHT),

CHT approaches – Bayesian Approach, Generalized Likelihood Approach, Performance of GLRT for Large Data Records, Equivalent Large Data Records Tests.

Course Outcomes:

a. The students will be able to apply various methods of signal estimation knowing the significance of each method.
b. The students will be able to know Cramer-Rao Lower bound in estimating a signal.
c. By applying suitable criterion the students will be able to detect the signals with minimum errors in the presence of noise.

Text Books:

1. Steven M. Kay, "Fundamentals of Statistical Signal Processing – Estimation Theory," Pearson, 2010.
2. Shanmugam and Breipohl, "Detection of Signals in Noise and Estimation," John Wiley& Sons, 2004.

References:

1. Mischa Schwartz, L.Shaw, "Signal Processing: Discrete Sprectral Analysis, Detection, and Estimation," McGraw Hill.
2. Harry L.Van Trees, Kristine L.Bell, Zhi Tian, "Detection Estimation and Modulation Theory, Part I: Detection, Estimation and Filtering Theory," 2nd Edition, Wiley, 2013.

MIXED SIGNAL DESIGN (17D38203)

L	T	P	C
4	0	0	4

Course Objectives: students will be able to

1. To understand the design of circuits in IC form especially both digital and analog designs.
2. To gain knowledge on power amplifiers and different feed concepts.
3. To acquire knowledge on design different architectures in mixed signal mode.
4. To gain the knowledge on data converters like Digital to Analog and Analog to Digital Converters.

UNIT – I:

Current Sources & Sinks: The cascode connection, sensitivity and temperature analysis, transient response, layout of simple Current Mirror, matching in MOSFET mirrors, other Current Sources/Sinks. Voltage dividers, current source self-biasing, band gap voltage references, Beta Multiplier Referenced Self-biasing.

UNIT – II:

Amplifiers: Gate Drain connected loads, Current Source Loads, Noise and Distortion, Class AB Amplifier. Feedback Amplifiers: Feedback Equation, properties of negative feedback and amplifier design, feedback topologies, amplifiers employing the four types of feedback, Stability.

UNIT – III:

Differential Amplifiers: The Source Coupled pair, the Source Cross-Coupled pair, cascode loads, Wide-Swing Differential Amplifiers, Operational Amplifiers: Basic CMOS Op-Amp Design, Operational Trans conductance Amplifiers, Differential Output Op-Amp.

UNIT – IV:

Non-Linear & Dynamic Analog Circuits: Basic CMOS Comparator Design, Adaptive Biasing, Analog Multipliers, MOSFET Switch, Switched Capacitor circuits: Switched Capacitor Integrator, dynamic circuits.

UNIT – V:

Data Converter Architectures: Data Converter Fundamentals, DAC & ADC specifications, Mixed Signal Layout issues, DAC architectures, ADC architectures.

Course Outcome: After completion of the course, students will be able to

a. Design mixed signal based circuits starting from basic constraints to advanced constraints.
b. Demonstrate in-depth knowledge in Data Converters – ADC and DAC, power amplifiers.
c. Design circuits like Various feedback concepts and op-amp circuits.
d. Understand the design of non-linear and dynamic analog circuits.

TEXT BOOKS:

1. Baker, Li, Boyce, "CMOS Circuit Design, Layout and Simulation," 1st Edition, Tata McGraw Hill,
2. Rudy Van De Plassche, "CMOS Integrated Analog-to-Digital and Digital-to Analog converters," Kluwer Academic Publishers, 2003

REFERENCES:

1. R. Jacob Baker, "CMOS Mixed-Signal Circuit Design", Wiley Interscience, 2009.
2. David A.Johns, Ken Martin, "Analog Integrated Circuit Design," John-Wiley & Sons, 1997.
3. B. Razavi, "Design of Analog CMOS Circuits," McGraw Hill, 2003.

EMBEDDED SYSTEM DESIGN (17D38204)

L	T	P	C
4	0	0	4

Course Objectives:

1. To study about current technologies, integration methods and hardware and software design concepts associated with processor in Embedded Systems.
2. To study about different types of memory and memory management schemes and various interfacing devices related to design of an Embedded System
3. To get detail knowledge regarding testing and hardware software co- design issues pertaining to design of an Embedded System

UNIT-I: Introduction

An Embedded System-Definition, Examples, Current Technologies, Integration in system Design, Embedded system design flow, hardware design concepts, software development, processor in an embedded system and other hardware units, introduction to processor based embedded system design concepts.

UNIT-II: Embedded Hardware

Embedded hardware building blocks, Embedded Processors – ISA architecture models, Internal processor design, processor performance, Board Memory – ROM, RAM, Auxiliary Memory, Memory Management of External Memory, Board Memory and performance.

Embedded board Input / output – Serial versus Parallel I/O, interfacing the I/O components, I/O components and performance, Board buses – Bus arbitration and timing, Integrating the Bus with other board components, Bus performance.

UNIT-III: Embedded Software

Device drivers, Device Drivers for interrupt-Handling, Memory device drivers, On-board bus device drivers, Board I/O drivers, Explanation about above drivers with suitable examples.

Embedded operating systems – Multitasking and process Management, Memory Management, I/O and file system management, OS standards example – POSIX, OS performance guidelines, Board support packages, Middleware and Application Software – Middle ware, Middleware examples, Application layer software examples.

UNIT-IV:

Embedded System Design, Development, Implementation and Testing

Embedded system design and development lifecycle model, creating an embedded system architecture, introduction to embedded software development process and tools- Host and Target machines, linking and locating software, Getting embedded software into the target system, issues in Hardware-Software design and co-design.

Implementing the design-The main software utility tool, CAD and the hardware, Translation tools, Debugging tools, testing on host machine, simulators, Laboratory tools, System Boot-Up.

UNIT-V: Embedded System Design-Case Studies

Case studies- Processor design approach of an embedded system –Power PC Processor based and Micro Blaze Processor based Embedded system design on Xilinx platform-NiosII Processor based Embedded system design on Altera platform-Respective Processor architectures should be taken into consideration while designing an Embedded System.

Course Outcomes: After completion of this course the students will be able to

a. Know clear knowledge regarding current technologies and issues relating to hardware and software design concepts associated with processor in Embedded Systems.
b. Understand complete knowledge pertaining to different types of memory and memory management schemes and various interfacing devices related to design of an Embedded System.
c. Explain different techniques related to testing and hardware software co- design issues pertaining to design of an Embedded System.

TEXT BOOKS:

1. Tammy Noergaard, “Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers”, Elsevier (Singapore) Pvt.Ltd.Publications, 2005.
2. Frank Vahid, Tony D. Givargis, “Embedded system Design: A Unified Hardware/Software Introduction”, John Wily & Sons Inc.2002.

REFERENCES:

1. Peter Marwedel, “Embedded System Design”, Science Publishers, 2007.
2. Arnold S Burger, “Embedded System Design”, CMP.
3. Rajkamal, “Embedded Systems: Architecture, Programming and Design”, TMH Publications, Second Edition, 2008.

I M.Tech II Semester

FUZZY SYSTEMS AND NEURAL NETWORKS (17D38205)

L	T	P	C
4	0	0	4

Course Objectives:

1. To analyze basic neural computational models.
2. To get in detail knowledge regarding different algorithms related to neural learning
3. To study about different issues related probability and fuzziness and different types of fuzzy associative memories.

UNIT-I

Basic Neural Computational Models:
Basic concepts of Neural Nets, Inference and learning , Classification models (single layer Perceptrons, multi layer perceptrons), Association models (Hop field Nets, Bidirectional associative memories)

UNIT - II

Supervised and Unsupervised learning; Statistical learning; Neural Network learning (Back propagation, Radial basis Function Networks, ART Networks)

UNIT - III

Rule-Based Neural networks; Network Training; Decision Tree Based NN's;
Incremental Learning: Principles; Symbolic methods; Neural Network Approaches (Probabilistic NN's); Incremental RBCN.

UNIT-IV

Fuzziness Vs Probability: Fuzzy Sets & Systems; The Geometry of Fuzzy sets; The Fuzzy Entropy Theorem; The Subsethood Theorem; The Entropy Subsethood Theorem.

UNIT - V

Fuzzy Associative Memories: Fuzzy & Neural Function Estimators; Fuzzy Hebbian FAMs; Adaptive FAMs. comparison of fuzzy & neural systems: Case Studies.

Course Outcomes: After completion of this course the students will be able to

a. Understand functioning of basic neural computational models.
b. Get complete knowledge regarding different algorithms related to neural learning
c. Understand about different issues related probability and fuzziness and different types of fuzzy associative memories.

Text Books:

1. B.Kosko, "Neural Networks & Fuzzy Systems", Prentice Hall (India) Ltd., 1992.
2. Yegna Narayanan, "Artificial Neural Networks". 8th Printing, PHI, 2003.

References:

1. Limin Fu,Neural, "Networks in Computer Intelligence", McGraw Hill Co., 1994.
2. S.Haykin "Neural Networks - A Comprehensive Foundation", Maxwell Macmillan International, 1991.

WIRELESS SENSOR NETWORKS (17D38206)

L	T	P	C
4	0	0	4

Course Objectives:

1. To study about different types of sensor networks, advantages, applications and the mechanism of transportation and processing involved in Wireless Sensor Networks.
2. To study about representation and different protocols and mechanisms involved in routing of Wireless Sensor Networks.
3. To study about tools and simulators associated with Wireless Sensor Networks.

UNIT-I

Sensor networks, advantages and applications, Sensor Network Applications - Habitat Monitoring, Smart Transportation, Collaborative Processing

UNIT - II

Localization and tracking,- sensing model, Distributed Representation, Tracking Multiple Objects networking sensors- Medium Access Control, Energy-Aware Routing to a Region, Attribute-Based Routing

UNIT-III

Infrastructure Establishment -Clustering and time synchronizations, Localization and localization services, Sensor tracking and control - Task-Driven Sensing, Information-Based Sensor Tasking, Sensor Group Management

UNIT-IV

Sensor Network data bases - Sensor Database Challenges , Query Interfaces , Data-Centric Storage, Multidimensional Indices for Orthogonal Range Searching, Locality-Preserving Hashing

UNIT - V

Sensor Network Platforms and Tools -Sensor Network hardware, Node level software, Node-Level Simulators, wireless sensor networks positioning and location management.

Course Outcomes: After completion of this course the students will be able to

a. Understand different types of sensor networks, advantages, applications and the mechanism of transportation and processing involved in Wireless Sensor Networks.
b. Understand about representation and different protocols and mechanisms involved in routing of Wireless Sensor Networks.
c. Gets complete knowledge regarding different tools and simulators associated with Wireless Sensor Networks.

REFERENCES:

1. F. Zhao, C Guibas, “Wireless Sensor Networks”, Elsevier, Morgan Kaufmann, 2004.
2. Kazem Sohraby, Daniel Minoli, Taieb Znati, “Wireless Sensor Networks -Technology, Protocols and Applications”, John Wiley & Sons, 2007.

SPEECH PROCESSING (17D38207)

L	T	P	C
4	0	0	4

Course Objectives:

1. To understand how speech signals are processed for Analysis and Synthesis. Also to understand speech processing in the context of its creation (anatomy, classification of sounds, etc.) as well as in its perception (psychology & neuroscience).
2. To analyze tools those are needed for analysis and synthesis, in the areas of digital signal processing for time-frequency analysis.

UNIT I

FUNDAMENTALS OF DIGITAL SPEECH PROCESSING: Anatomy & Physiology of Speech organs, the process of speech production, the acoustic theory of speech production, Digital models for speech signals.

TIME DOMAIN MODELS FOR SPEECH PROCESSING: Introduction- Window considerations, Short time energy and average magnitude Short time average zero crossing rate ,Speech vs silence discrimination using Average energy and zero crossing, Pitch period estimation using parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

UNIT II

LINEAR PREDICTIVE CODING (LPC) ANALYSIS: Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition, Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

UNIT III

HOMOMORPHIC SPEECH PROCESSING: Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, the Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, The Homomorphic Vocoder.

SPEECH ENHANCEMENT: Nature of interfering sounds, Speech enhancement techniques, Spectral subtraction, Enhancement by re-synthesis.

UNIT IV

AUTOMATIC SPEECH RECOGNITION: Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit Recognition System,. Continuous digit Recognition System

SPEAKER RECOGNITION: Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.

UNIT V

HIDDEN MARKOV MODEL (HMM) FOR SPEECH: Hidden markov model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS, Adapting to variability in speech, Language models.

Course Outcomes: After completing the course, the student will be familiar with the principles and the techniques used in speech processing. This includes speech synthesis, speech coding and speech recognition.

TEXT BOOKS:

1. L.R Rabiner and S.W.Schafer, "Digital Processing of Speech Signals", Pearson, 2007.
2. Thomas F. Quateri, "Discrete Time Speech Signal Processing", 1st Edition, Pearson Edition.

REFERENCES:

1. Douglas O Shaughnessy, "Speech communication", Second Edition Oxford University press, 2000.
2. L.R Rabinar and B.H.Juang, "Fundamentals of Speech Recognition," PHI, 1993.
3. Ben Gold & Nelson Morgan, "Speech & Audio Signal Processing", 1st Edition, Wiley.

INTERNET OF THINGS (17D38208)

L	T	P	C
4	0	0	4

Course Objectives:

1. To introduce the terminology, technology and its applications.
2. To introduce the raspberry PI platform, that is widely used in IoT applications.
3. To introduce the implementation of web based services on IoT devices.

UNIT I :

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

UNIT II:

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT III:

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT IV:

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT V:

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

Course Outcomes: After completion of the course, the student should able to

a. Understand the new computing technologies
b. Apply the latest computing technologies like cloud computing technology and Big Data
c. Introduce the concept of Machine to Machine (M2M) with necessary protocols
d. Acquire the skill to write programs using python scripting language used in many IoT devices

TEXT BOOKS:

1. Arshdeep Bahga and Vijay Madisetti, “Internet of Things - A Hands-on Approach,” 1st Edition, Universities Press, 2015.
2. Matt Richardson & Shawn Wallace, “Getting Started with Raspberry Pi,” Maker Media Inc., O'Reilly, 2014.

MULTIMEDIA COMMUNICATIONS (17D38209)

L	T	P	C
4	0	0	4

Course Objectives:

1. To study basic requirements of Multimedia Communications.
2. To study about different coding schemes involved in Multimedia Communications.
3. To study about different standards and protocols related Multimedia Communications and its networks.

UNIT-I

Multimedia communications - multimedia requirements, Audio Visual integration - Lip synchronization, Audio-to-visual mapping, Bio-model person verification, Joint Audio-Video coding

UNIT - II

Multimedia information processing, Perceptual coding of digital audio signals - hybrid coder -differential perceptual audio coder, Image coding, Video coding, Water marking

UNIT-III

ANNS for multimedia processing - NN techniques for motion estimation, face detection and recognition, Distributed multimedia systems, IP based networks, Multimedia Operating Systems.

UNIT-IV

Multimedia Communication Standards - overview of MPEG 1, MPEG-2, MPEG-4 and MPEG-7., Real time multimedia transmission across the Internet

UNIT - V

Multimedia Communication across networks - packet audio / video, Streaming video across internet, Multimedia transport across IP/ATM Networks and Wireless networks

Course Outcomes: After completion of this course the students will be able to

a. Gets knowledge regarding fundamentals of Multimedia Communications
b. Understand about different coding schemes involved in Multimedia Communications.
c. Gets complete knowledge regarding different standards and protocols related Multimedia Communications and its networks.

TEXT BOOKS:

1. K R Rao et al, “Multimedia Communication Systems: Techniques and Standards”, Pearson, 2002.

REFERENCES:

1. Tay Vaughan, “Multimedia- Making it Work”, TMH, 5th Edition, 2001.
2. Pk Andleigh , K. Thakkar, “Multimedia Systems Design”, PHI,2002.

ADVANCED COMMUNICATIONS LAB (17D38210)

L	T	P	C
0	0	3	2

Course Objectives:

1. To generate random data at given rates and employ different modulation schemes over generated data.
2. To simulate different modulated signals and diversity schemes over AWGN, and estimate data reception using different algorithms.
3. To implement RAKE receiver and estimate its performance through BER curve.

List of Experiments:

1. Generation of Random data at a given data rate (Hardware & Software) – (M-Sequence).
2. Simulation of Rayleigh fading channel incorporating speed of the mobile & Power delay profile
3. Simulation of BPSK system over AWGN channel & finding its performance with BER plot.
4. Implementation of Equalization at the receiver to remove ISI caused due to Low channel bandwidth
5. Simulation of CDMA signal using QPSK modulation scheme &obtain matched filter response over AWGN Channel
6. Implementation of RAKE receiver & finding its performance through BER Curve
7. Implementation of L.M.S algorithm to estimate the original data when it is corrupted by noise & channel.
8. Implementation of R.L.S algorithm to estimate the original data when it is corrupted by noise & channel.

Tools Required: MATLAB – 7.0 & above

Course Outcomes: After completion of this course the students will be able to

a. Generate random data at given rates and employ different modulation schemes over generated data.
b. Simulate different modulated signals and diversity schemes over AWGN, and estimate data reception using different algorithms.
c. Implement RAKE receiver and estimate its performance through BER curve.

MIXED SIGNAL DESIGN LAB (17D38211)

L	T	P	C
0	0	3	2

Course Objectives: students will be able to

1. Know basic electronics involved in the design of MOS circuits.
2. To design a schematic and layout for Combinational and Sequential Circuits
3. Analyze the power and timing of Combinational and Sequential Circuits using EDA tools

List of experimental Concepts:

1. Analog circuit simulation.
2. Digital circuit simulation.
3. Mixed signal simulation.
4. Layout Extraction.
5. Parasitic values estimation from layout.
6. Layout Vs Schematic.
7. Net List Extraction.
8. Design Rule Checks

Equipment/Software Required:

- EDA Tools - Industry Standard software-latest version like Mentor/ Synopsys /Equivalent.
- Personal computer with necessary peripherals.

Course Outcome: After completion of the course, students will be able to

a. Make models of transistor circuits and simulate them for various operational requirements.
b. Design of analog and digital circuits using EDA tools.
c. Analyze and design of VLSI circuits.