MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

Sponsored by CMR Educational Society

(Affiliated to JNTU, Hyderabad, Approved by AICTE - Accredited by NBA & NAAC – 'A' Grade - ISO 9001:2008 Certified)

Maisammaguda, Dhulapally (Post Via Hakimpet), Secunderabad – 500100, Telangana State, India.

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MASTER OF TECHNOLOGY
SYSTEMS & SIGNAL PROCESSING

DEPARTMENT OF
ELECTRONICS AND COMMUNICATION ENGINEERING

ACADEMIC REGULATIONS
COURSE STRUCTURE AND SYLLABUS
(Batches admitted from the academic year 2015 - 2016)

Note: The regulations hereunder are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already pursuing the program) as may be decided by the Academic Council.

PRELIMINARY DEFINITIONS AND NOMENCLATURES

*"Autonomous Institution /College" means an institution/college designated as autonomous institute / college by University Grants Commission (UGC), as per the UGC Autonomous College Statutes.

*"Academic Autonomy" means freedom to a College in all aspects of conducting its academic programs, granted by the University for promoting excellence.

*"Commission" means University Grants Commission.

*"AICTE" means All India Council for Technical Education.

*"University" the Jawaharlal Nehru Technological University, Hyderabad.

*"College" means Malla Reddy College of Engineering & Technology, Secunderabad unless indicated otherwise by the context.

*"Program" means:

> Master of Technology (M.Tech) degree program

> PG Degree Program: M.Tech

*"Branch" means specialization in a program like M.Tech degree program in Electronics and Communication Engineering, M.Tech degree program in Computer Science and Engineering etc.

*"Course" or "Subject" means a theory or practical subject, identified by its course – number and course-title, which is normally studied in a semester.

*T–Tutorial, P–Practical, D–Drawing, L-Theory, C-Credits

FOREWORD

The autonomy is conferred on Malla Reddy College of Engineering & Technology (MRCET) by UGC based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like UGC and AICTE. It reflects the confidence of the UGC in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own curriculum, examination system and monitoring mechanism, independent of the affiliating University but under its observance.

Malla Reddy College of Engineering & Technology (MRCET) is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, and also improving upon the values and beliefs for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the College and recommendations of the JNTU Hyderabad to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several experts drawn from academics, industry and research, in accordance with the vision and mission of the college which reflects the mindset of the institution in order to produce quality engineering graduates to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications, if needed, are to be sought at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The Cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the institution and brighter prospects of engineering graduates.

"A thought beyond the horizons of success committed for educational excellence"

PRINCIPAL

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

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Maisammaguda, Dhulapally (Post Via Hakimpet), Secunderabad – 500100, Telangana State, India.

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VISION

❖ To establish a pedestal for the integral innovation, team spirit, originality and competence in the students, expose them to face the global challenges and become technology leaders of Indian vision of modern society.

MISSION

❖ To become a model institution in the fields of Engineering, Technology and Management.

❖ To impart holistic education to the students to render them as industry ready engineers.

❖ To ensure synchronization of MRCET ideologies with challenging demands of International Pioneering Organizations.

QUALITY POLICY

❖ To implement best practices in Teaching and Learning process for both UG and PG courses meticulously.

❖ To provide state of art infrastructure and expertise to impart the quality education.

❖ To groom the students to become intellectually creative and professionally competitive.

❖ To channelize the activities and tune them in heights of commitment and sincerity, the requisites to claim the never ending ladder of SUCCESS year after year.

For more information: www.mrcet.ac.in

ACADEMIC REGULATIONS R-15 FOR M. TECH. (REGULAR) DEGREE COURSE

Academic Regulations of R-15 are applicable for the students of M. Tech. (Regular) Course from the Academic Year 2015-16 and onwards. The M.Tech Degree of Malla Reddy College of Engineering & Technology (MRCET), Secunderabad shall be conferred on candidates who are admitted to the program and who fulfill all the requirements for the award of the Degree.

1.0 ELIGIBILITY FOR ADMISSIONS

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

Admissions shall be made on the basis of merit/rank obtained by the candidates at the qualifying Entrance Test conducted by the University (or) State Government (or) on the basis of any other order of merit as approved by the University, subject to norms as laid down by the State Govt. from time to time.

2.0 AWARD OF M. TECH. DEGREE

2.1. A student shall be declared eligible for the award of the M. Tech. Degree, if he pursues a course of study in not less than two and not more than four academic years.

2.2. A student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the year of his admission, shall forfeit his seat in M. Tech. course.

2.3. The student shall register for all 88 credits and secure all the 88 credits.

2.4. The minimum instruction days in each semester are 90.

3.0 A. COURSE OF STUDY

The following specializations are offered at present for the M. Tech. course of study.
1. Aerospace Engineering
2. Computer Science and Engineering
3. Machine Design
4. System and Signal Processing
5. VLSI and Embedded Systems
6. Thermal Engineering

and any other course as approved by the MRCET from time to time.

3.0 B. Departments offering M. Tech. Programmes with specializations are noted below:

Aeronautical Engineering	Aerospace Engineering
Computer Science Engineering	Computer Science Engineering
Electronics & Communication Engineering	System & Signal Processing
Electronics & Communication Engineering	VLSI and Embedded Systems
Mechanical Engineering	Machine Design
Mechanical Engineering	Thermal Engineering

4.0 ATTENDANCE

The programs are offered on a unit basis with each subject being considered a unit.

4.1 A student shall be eligible to write University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

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

4.3 Shortage of Attendance below 65% in aggregate shall not be condoned.

4.4 Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class and their registration shall stand cancelled.

4.5 A prescribed fee as determined by the examination branch shall be payable towards condonation of shortage of attendance.

4.6 A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

4.7 In order to qualify for the award of the M. Tech. Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.

4.8 A student shall not be promoted to the next semester unless he satisfies the minimum academic requirements of the previous semester.

5.0 EVALUATION

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

For the theory subjects 75 marks shall be awarded based on the performance in the End Semester Examination and 25 marks shall be awarded based on the Internal Examination Evaluation. The internal evaluation consists of two mid-term examination of 25 marks each covering descriptive paper which consists 5 questions consisting of two parts each (a) and (b), out of which the student has to answer either (a) or (b), not both. Each question carries 5 marks for a total duration of 2 hours. The total marks secured by the student in each mid-term examination are evaluated for 25 marks, and the average of the two mid-term examinations shall be taken as the final marks secured by each candidate.

However, any student scoring internal marks less than 40% will be given a chance to write the internal exam once again after he/she re-registering for the concerned subject and paying stipulated fees as per the norms.

5.1 The end semesters examination will be conducted for 75 marks with 5 questions consisting of two questions each (a) and (b), out of which the student has to answer

either (a) or (b), not both and each question carries 15 marks.

5.2 For practical subjects, 75 marks shall be awarded based on the performance in the End Semester Examinations and 25 marks shall be awarded based on the day-to-day performance as Internal Marks.

5.3 There shall be two seminar presentations during I year I semester and II semester respectively. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Departmental Academic Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For each Seminar there will be only internal evaluation of 50 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

5.4 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 semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Examination taken together.

5.5 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.4) he has to reappear for the End semester Examination in that subject.

5.6 A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and so has failed in the end examination. In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those subject(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt stand cancelled.

5.7 In case the candidate secures less than the required attendance in any subject, he shall not be permitted to write the End Examination in that subject. He shall re-register the subject when next offered.

5.8 Laboratory examination for M. Tech. courses must be conducted with two Examiners, one of them being the Laboratory Class Teacher and the second examiner shall be another Laboratory Teacher.

6.0 EVALUATION OF PROJECT/DISSERTATION WORK

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

6.1 A Project Review Committee (PRC) shall be constituted with Principal as Chairperson, Heads of all the Departments offering the M. Tech. programs and two other senior faculty members.

6.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical.

6.3 After satisfying 6.2, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work to the Departmental Academic Committee for approval. Only after obtaining the approval of the Departmental Academic Committee can the student initiate the

Project work.

6.4 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Departmental Academic Committee. However, the Departmental Academic Committee shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

6.5 A candidate shall submit his status report in a bound-form in two stages at least with a gap of 3 months between them.

6.6 The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of theory and practical course with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Principal through Head of the Department and make an oral presentation before the PRC.

6.7 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College/School/Institute.

6.8 The thesis shall be adjudicated by one examiner selected by the University. For this, the Principal of the College shall submit a panel of 5 examiners, eminent in that field, with the help of the guide concerned and head of the department.

6.9 If the report of the examiner is not favorable, the candidate shall revise and resubmit the Thesis, in the time frame as decided by the PRC. If the report of the examiner is unfavorable again, the thesis shall be summarily rejected.

6.10 If the report of the examiner is favorable, Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work as one of the following:

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

The Head of the Department shall coordinate and make arrangements for the conduct of Viva- Voce examination.

If the report of the Viva-Voce is unsatisfactory, the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva- Voce examination, he will not be eligible for the award of the degree.

7.0 AWARD OF DEGREE AND CLASS

In assessing the performance of the students in examinations, the usual approach is to award marks based on the examinations conducted at various stages (sessional, mid-term, end-semester etc.,) in a semester. As per UGC Autonomous guidelines, the following system is implemented in awarding the grades and CGPA under the Credit Based Semester System (CBCS).

Letter Grades and Grade Points:

The UGC recommends a 10-point grading system with the following letter grades as given below:

Grades	Points	Marks secured (%)
O (Outstanding)	10	≥ 85
A+(Excellent)	9	80 – 84
A(Very Good)	8	75 – 79
B+(Good)	7	70 – 74
B(Above Average)	6	65 – 69
C(Average)	5	60 – 64
P(Pass)	4	50 – 59
F(Fail)	0	<50
Ab(Absent)	0	-

A student obtaining Grade F shall be considered failed and will be required to reappear in the examination

Computation of SGPA and CGPA

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The 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 $(S_i) = \Sigma(C_i \times G_i) / \Sigma C_i$

where C_i is the number of credits of the ith course and G_i is the grade point scored by the student in the ith course.

ii. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

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

where S_i is the SGPA of the ith semester and C_i is the total number of credits in that semester.

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

8.0 WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the Institute or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

9.0 TRANSITORY REGULATIONS

    9.1   Discontinued, detained, or failed candidates are eligible for admission to two earlier or equivalent subjects at a time as and when offered.

10. GENERAL

10.1 Wherever the words he, him, his, occur in the regulations, they include she, her, hers .

10.2 The academic regulation should be read as a whole for the purpose of any interpretation.

10.3 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council of the College is final.

10.4 The College may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Academic Council of the College/Affiliating University.

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals

		and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the othe subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Using objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for

	person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-incharge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	the remaining examinations of the subjects of that semester. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other

	clause 6 to 8.	subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Academic Council of the College (or) affiliating University for further action towards suitable punishment.	

Malpractices identified by squad or special invigilators will entail punishment to the candidates as per the above guidelines..

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
M.TECH - SYSTEMS & SIGNAL PROCESSING
COURSE STRUCTURE & SYLLABUS

I Year I Semester

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R15D9301	Transform Techniques	4	-	3	25	75
2	R15D9302	Multimedia Processing	4	-	3	25	75
3	R15D9303	Embedded System Design	4	-	3	25	75
4	R15D9304 R15D9305 R15D9306	Elective 1 1. Biomedical Signal Processing 2. Radar Signal Processing 3. VLSI Signal Processing	4	-	3	25	75
5	R15D9307 R15D9308 R15D9309	Elective 2 1.Advanced Data Communications 2. Detection and Estimation Theory 3. Digital System Design	4	-	3	25	75
6	R15D5802 R15D5803 R15D5812	Open Elective 1 1.Advanced Operating Systems 2.Computer System Design 3.Web Services and Service oriented Architecture	4	-	3	25	75
7	R15D9381	Advanced Signal Processing Lab1	-	3	2	25	75
8	R15D9382	Technical Seminar-I	-	-	2	50	-
		Total	24	3	22	225	525

I Year II Semester

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	R15D9310	Adhoc –Wireless Networks	4	-	3	25	75
2	R15D9311	Coding Theory & Techniques	4	-	3	25	75
3	R15D9312	Multirate Signal Processing	4	-	3	25	75
4	R15D9313 R15D9314 R15D9315	Elective 3 1. Hardware-Software Co-Design 2. Embedded RTOS 3. Wireless Channel Coding	4	-	3	25	75
5	R15D9316 R15D9317 R15D9318	Elective 2 1.Mobile Computing Technologies 2. SoC Architectures 3. Array Signal Processing	4	-	3	25	75
6	R15D5805 R15D5810 R15D5816	Open Elective 2 1.Natural Language Processing 2.Advanced Network Programming 3.Grid and Cloud Computing	4	-	3	25	75
7	R15D9383	Advanced Signal Processing Lab 2	-	3	2	25	75
8	R15D9384	Technical Seminar-II	-	-	2	50	-
		Total	**24**	**3**	**22**	**225**	**525**

II Year I Semester

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	-	Project Review Seminars	-	-	4	-	-
2	-	Project Work	-	-	18	-	-
		Total	**-**	**-**	**22**	**-**	**-**

II Year II Semester

S.NO.	SUBJECT CODE	SUBJECT	L	T/P/D	C	MAX MARKS	
						INT	EXT
1	-	Project Work	-	-	22	-	-
2	-	Project Viva-voce	-	-	-	-	-
		Total	**-**	**-**	**22**	**-**	**-**

TRANSFORM TECHNIQUES

UNIT -I:
Fourier Analysis: Vector space, Hilbert spaces, Fourier basis, FT- Limitations of Fourier Analysis, Need for time-frequency analysis, DFT, 2D-DFT: Definition, Properties and Applications, IDFT, Hilbert Transform, STFT.

UNIT -II:
Transforms: Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT, – definition, properties and applications

UNIT -III:
Continuous Wavelet Transform (CWT): 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- Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies.

UNIT -IV:
Multi Rate Analysis and DWT: Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -V:
Special Topics: Wavelet Packet Transform, Multidimensional Wavelets, Bi-orthogonal basis-BSplines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS:
1. Wavelet Transforms-Introduction theory and applications -Raghuveer M.Rao and Ajit S.Bopardikar, Pearson Edu, Asia, New Delhi, 2003.
2. "Insight into Wavelets from Theory to Practice" - Soman. K. P, Ramachandran. K.I,Printice Hall India, First Edition, 2004.

REFERENCE BOOKS:
1. Fundamentals of Wavelets- Theory, Algorithms and Applications -Jaideva C Goswami,Andrew K Chan, John Wiley & Sons, Inc, Singapore, 1999.
2. Wavelets and Sub-band Coding -Vetterli M. Kovacevic, PJI, 1995.3. Introduction to Wavelets and Wavelet Transforms -C. Sydney Burrus, PHI, First Edition,1997.
4. A Wavelet Tour of Signal Processing-Stephen G. Mallat, Academic Press, 2 Ed
5. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009

(R15D9302) MULTIMEDIA PROCESSING

UNIT I - Audio Processing Systems
Digital Signal Processors: Fixed Point DSPs, Floating Point DSPs, Development Tools, Digital Audio Interfaces: Two-Channel AES/EBU Interface, MADI Interface, Single Processor Systems: Peripherals, Control, Multi Processor Systems: Connection via Serial Links, Connection via Parallel Links, Connection via Standard Bus Systems, Scalable Audio System

UNIT II – Equalizers
Recursive Audio Filters: Design, Parametric Filter structures, Quantization Effects, Non-recursive Audio Filters: Fast Convolution, Fast Convolution of Long Sequences, Filter Design by Filter Sampling, Multi-Complementary Filter Bank: Principles, Example: 8-band Multi Complementary Filter Bank

UNIT III - Audio Coding
Audio Coding: Lossless Audio Coding, Lossy Audio Coding, Psycho acoustics, Advanced Audio Coding (MPEG Coding Standards), Spectral Band Replication, Java Applet- Psycho acoustics.

UNIT -IV:
Video Processing: Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

UNIT –V:
Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation Block-Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:
1. .Udo Zolzer, "Digital Audio Signal Processing" 2nd Edition, John Wiley Sons & Pvt Ltd.
2. Digital Image Processing – Gonzaleze and Woods, 3rd Ed., Pearson.
3. Video Processing and Communication – Yao Wang, Joem Ostermann and Ya–quin Zhang. 1st Ed., PH Int.

REFRENCE BOOKS:
1. Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools – Scotte Umbaugh, 2nd Ed, CRC Press, 2011.
2. Digital Video Processing – M. Tekalp, Prentice Hall International.
3. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH, 2009.
4. Multidimentional Signal, Image and Video Processing and Coding – John Woods, 2nd Ed, Elsevier.
5. Digital Image Processing with MATLAB and Labview – Vipula Singh, Elsevier.
6. Video Demystified – A Hand Book for the Digital Engineer – Keith Jack, 5th Ed., Elsevier.

EMBEDDED SYSTEM DESIGN

UNIT –I:
ARM Architecture:
ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families.

UNIT –II:
ARM Programming Model – I:
Instruction Set: Data Processing Instructions, Addressing Modes, Branch, Load, Store Instructions,
PSR Instructions, Conditional Instructions.

UNIT –III:
ARM Programming Model – II:
Thumb Instruction Set: Register Usage, Other Branch Instructions, Data Processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions

UNIT –IV:
ARM Programming:
Simple C Programs using Function Calls, Pointers, Structures, Integer and Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, Conditional Execution and Loops.

UNIT –V:
Memory Management:
Cache Architecture, Polices, Flushing and Caches, MMU, Page Tables, Translation, Access Permissions, Context Switch.

TEXT BOOKS:
1. ARM Systems Developer's Guides- Designing & Optimizing System Software – Andrew N. Sloss, Dominic Symes, Chris Wright, 2008, Elsevier.
2. Professional Embedded ARM development-James A Langbridge, Wiley/Wrox

REFERENCE BOOKS:
1. Embedded Microcomputer Systems, Real Time Interfacing – Jonathan W. Valvano – Brookes / Cole, 1999, Thomas Learning.
2.ARM System on Chip Architecture, Steve Furber, 2nd Edition, Pearson

BIOMEDICAL SIGNAL PROCESSING
(ELECTIVE – I)

UNIT -I:
Random Processes: Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth and noise figure of systems.

UNIT -II:
Data Compression Techniques: Lossy and Lossless data reduction Algorithms, ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantisation, DICOM Standards

UNIT -III:
Cardiological Signal Processing: Pre-processing, QRS Detection Methods, Rhythm analysis, Arrhythmia Detection Algorithms, Automated ECG Analysis, ECG Pattern Recognition. Adaptive Noise Cancelling: Principles of Adaptive Noise Cancelling, Adaptive Noise Cancelling with the LMS Adaptation Algorithm, Noise Cancelling Method to Enhance ECG Monitoring, Fetal ECG Monitoring.

UNIT -IV:
Signal Averaging, Polishing: Mean and trend removal, Prony's method, Prony's Method based on the Least Squares Estimate, Linear prediction, Yule – Walker (Y –W) equations, Analysis of Evoked Potentials.

UNIT -V:
Neurological Signal Processing: Modelling of EEG Signals, Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves, Auto Regressive (A.R.) modelling of seizure EEG, Sleep Stage analysis, Inverse Filtering, Least squares and polynomial modelling.

TEXT BOOKS:
1. Probability, Random Variables & Random Signal Principles – Peyton Z. Peebles, 4th Ed., 2009, TMH.
2. Biomedical Signal Processing- Principles and Techniques - D. C. Reddy, 2005, TMH.
REFERENCE BOOKS:
1. Digital Biosignal Processing - Weitkunat R, 1991, Elsevier.
2. Biomedical Signal Processing - Akay M , IEEE Press.
3. Biomedical Signal Processing -Vol. I Time & Frequency Analysis - Cohen.A, 1986, CRC Press.
4. Biomedical Digital Signal Processing: C-Language Experiments and Laboratory Experiments, Willis J. Tompkins, PHI.

RADAR SIGNAL PROCESSING
(ELECTIVE - I)

UNIT -I:
Introduction: Radar Block Diagram, Radar Equation, Information Available from Radar Echo. Review of Radar Range Performance– General Radar Range Equation, Radar Detection with Noise Jamming, Beacon and Repeater Equations, Bistatic Radar.Matched Filter Receiver – Impulse Response, Frequency Response Characteristic and its Derivation, Matched Filter and Correlation Function, Correlation Detection and Cross-Correlation Receiver, Efficiency of Non-Matched Filters, Matched Filter for Non-White Noise.

UNIT -II:
Detection of Radar Signals in Noise: Detection Criteria – Neyman-Pearson Observer, Likelihood-Ratio Receiver, Inverse Probability Receiver, Sequential Observer, Detectors – Envelope Detector, Logarithmic Detector, I/Q Detector. Automatic Detection - CFAR Receiver, Cell Averaging CFAR Receiver, CFAR Loss, CFAR Uses in Radar. Radar Signal Management – Schematics, Component Parts, Resources and Constraints.

UNIT -III:
Waveform Selection [3, 2]: Radar Ambiguity Function and Ambiguity Diagram – Principles and Properties; Specific Cases – Ideal Case, Single Pulse of Sine Wave, Periodic Pulse Train, Single Linear FM Pulse, Noise Like Waveforms, Waveform Design Requirements, Optimum Waveforms for Detection in Clutter, Family of Radar Waveforms.

UNIT -IV:
Pulse Compression in Radar Signals: Introduction, Significance, Types, Linear FM Pulse Compression – Block Diagram, Characteristics, Reduction of Time Side lobes, Stretch Techniques, Generation and Decoding of FM Waveforms – Block Schematic and Characteristics of Passive System, Digital Compression, SAW Pulse Compression.

UNIT V:
Phase Coding Techniques: Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar. Poly Phase Codes : Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Side lobe Reduction for Phase Coded PC Signals.

TEXT BOOKS:
1. Radar Handbook - M.I. Skolnik, 2nd Ed., 1991, McGraw Hill.
2. Radar Design Principles : Signal Processing and The Environment - Fred E. Nathanson, 2nd Ed.,1999, PHI.
3. Introduction to Radar Systems - M.I. Skolnik, 3rd Ed., 2001, TMH.

REFERENCE BOOKS:
1. Radar Principles - Peyton Z. Peebles, Jr., 2004, John Wiley.
2. Radar Signal Processing and Adaptive Systems - R. Nitzberg, 1999, Artech House.
3. Radar Design Principles - F.E. Nathanson, 1st Ed., 1969, McGraw Hill.

VLSI SIGNAL PROCESSING
(ELECTIVE -I)

UNIT -I:
Introduction to DSP: Typical DSP algorithms, DSP algorithms benefits, Representation of DSP algorithms
Pipelining and Parallel Processing: Introduction, Pipelining of FIR Digital filters, Parallel Processing, Pipelining and Parallel Processing for Low Power
Retiming: Introduction – Definitions and Properties – Solving System of Inequalities – Retiming Techniques

UNIT –II:
Folding and Unfolding: Folding: Introduction -Folding Transform - Register minimization Techniques – Register minimization in folded architectures – folding of multirate systems
Unfolding: Introduction – An Algorithm for Unfolding – Properties of Unfolding – critical Path, Unfolding and Retiming – Applications of Unfolding

UNIT -III:
Systolic Architecture Design: Introduction – Systolic Array Design Methodology – FIR Systolic Arrays – Selection of Scheduling Vector – Matrix Multiplication and 2D Systolic Array Design – Systolic Design for Space Representations contain Delays

UNIT -IV:
Fast Convolution: Introduction – Cook-Toom Algorithm – Winogard algorithm – Iterated Convolution – Cyclic Convolution – Design of Fast Convolution algorithm by Inspection

UNIT -V:
Low Power Design: Scaling Vs Power Consumption –Power Analysis, Power Reduction techniques – Power Estimation Approaches Programmable DSP: Evaluation of Programmable Digital Signal Processors, DSP Processors for Mobile and Wireless Communications, Processors for Multimedia Signal Processing

TEXT BOOKS:
1. VLSI Digital Signal Processing- System Design and Implementation – Keshab K. Parhi,1998, Wiley Inter Science.
2. VLSI and Modern Signal Processing – Kung S. Y, H. J. While House, T. Kailath, 1985,Prentice Hall.

REFERENCE BOOKS:
1. Design of Analog – Digital VLSI Circuits for Telecommunications and Signal Processing – Jose E. France, Yannis Tsividis, 1994, Prentice Hall.
2. VLSI Digital Signal Processing – Medisetti V. K, 1995, IEEE Press (NY), USA

ADVANCED DATA COMMUNICATIONS
(ELECTIVE – II)

UNIT -I:
Digital Modulation Schemes: BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:
Basic Concepts of Data Communications, Interfaces and Modems: Data Communication Networks, Protocols and Standards, UART, USB, I2C, I2S, Line Configuration, Topology,Transmission Modes, Digital Data Transmission, DTE-DCE interface, Categories of Networks – TCP/IP Protocol suite and Comparison with OSI model.

UNIT -III:
Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code
Data Link Control: Line Discipline, Flow Control, Error Control
Data Link Protocols: Asynchronous Protocols, Synchronous Protocols, Character Oriented Protocols, Bit-Oriented Protocol, Link Access Procedures.

UNIT -IV:
Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.
Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.
Metropolitan Area Networks: IEEE 802.6, SMDS
Switching: Circuit Switching, Packet Switching, Message Switching.
Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:
Multiple Access Techniques: Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization, Frequency- Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA),OFDM and OFDMA.

TEXT BOOKS:
1. Data Communication and Computer Networking - B. A.Forouzan, 2nd Ed., 2003, TMH.
2. Advanced Electronic Communication Systems - W. Tomasi, 5th Ed., 2008, PEI.
REFERENCE BOOKS:
1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2. Data and Computer Communications - William Stallings, 8th Ed., 2007, PHI.
3. Data Communication and Tele Processing Systems -T. Housely, 2nd Ed, 2008, BSP.
4. Data Communications and Computer Networks- Brijendra Singh, 2nd Ed., 2005, PHI.

DETECTION AND ESTIMATION THEORY
(ELECTIVE - II)

UNIT –I:
Random Processes: Discrete Linear Models, Markov Sequences and Processes, Point Processes, and Gaussian Processes.

UNIT –II:
Detection Theory: Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)- minimum probability error with and without equal a priori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT –III:
Linear Minimum Mean-Square Error Filtering: Linear Minimum Mean Squared Error stimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with tored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –IV:
Statistics: Measurements, Nonparametric Estimators of Probability Distribution and Density Functions, Point Estimators of Parameters, Measures of the Quality of Estimators, Introduction to Interval Estimates, Distribution of Estimators, Tests of Hypotheses, Simple Linear Regression, Multiple Linear Regression.

UNIT –V:
Estimating the Parameters of Random Processes from Data: Tests for Stationarity and Ergodicity, Model-free Estimation, Model-based Estimation of Autocorrelation Functions, Power Special Density Functions.

TEXT BOOKS:
1. Random Signals: Detection, Estimation and Data Analysis - K. Sam Shanmugan & A.M. Breipohl, Wiley India Pvt. Ltd, 2011.
2. Random Processes: Filtering, Estimation and Detection - Lonnie C. Ludeman, Wiley India Pvt. Ltd., 2010.

REFERENCE BOOKS:
1. Fundamentals of Statistical Signal Processing: Volume I Estimation Theory– Steven.M.Kay, Prentice Hall, USA, 1998.
2. Fundamentals of Statistical Signal Processing: Volume I Detection Theory– Steven.M.Kay, Prentice Hall, USA, 1998.
3. Introduction to Statistical Signal Processing with Applications - Srinath, Rajasekaran, Viswanathan, 2003, PHI.

DIGITAL SYSTEM DESIGN
(ELECTIVE -II)

UNIT -I:
Minimization and Transformation of Sequential Machines: The Finite State Model – Capabilities and limitations of FSM – State equivalence and machine minimization – Simplification of incompletely specified machines. Fundamental mode model – Flow table – State reduction – Minimal closed covers – Races, Cycles and Hazards.

UNIT -II:
Digital Design: Digital Design Using ROMs, PALs and PLAs, BCD Adder, 32 – bit adder, State graphs for control circuits, Scoreboard and Controller, A shift and add multiplier, Array multiplier, Keypad Scanner, Binary divider.

UNIT -III:
SM Charts: State machine charts, Derivation of SM Charts, Realization of SM Chart, Implementation of Binary Multiplier, dice game controller.

UNIT -IV:
Fault Modeling & Test Pattern Generation: Logic Fault model – Fault detection & Redundancy-Fault equivalence and fault location –Fault dominance – Single stuck at fault model – Multiple stuck at fault models –Bridging fault model. Fault diagnosis of combinational circuits by conventional methods – Path sensitization techniques, Boolean Difference method – Kohavi algorithm – Test algorithms – D algorithm, PODEM, Random testing, Transition count testing, Signature analysis and test bridging faults.

UNIT - V:
Fault Diagnosis in Sequential Circuits: Circuit Test Approach, Transition Check Approach –State identification and fault detection experiment, Machine identification, Design of fault detection experiment

TEXT BOOKS:
1. Fundamentals of Logic Design – Charles H. Roth, 5th Ed., Cengage Learning.
2. Digital Systems Testing and Testable Design – Miron Abramovici, Melvin A.Breuer and Arthur D. Friedman- John Wiley & Sons Inc.
3. Logic Design Theory – N. N. Biswas, PHI

REFERENCE BOOKS:
1. Switching and Finite Automata Theory – Z. Kohavi , 2nd Ed., 2001, TMH
2. Digital Design – Morris Mano, M.D.Ciletti, 4th Edition, PHI.
3. Digital Circuits and Logic Design – Samuel C. Lee , PHI

ADVANCED OPERATING SYSTEMS
(OPEN ELECTIVE-I)

UNIT I
Real-time operating systems: Design issues, principles and case study.

UNIT II
Distributed operating system: Design issues, features and principles of working, case study.

UNIT III
Network operating system: Design issues, working principles and characteristic features, case study.

UNIT IV
Kernel development: Issues and development principles, case study.

UNIT V
Protection, privacy, access control and security issues, solutions.

TEXT BOOKS:
1. A.Silberschatz - Applied Operating System Concepts, Wiley, 2000.
2. Lubemir F Bic and Alan C. Shaw - Operating System Principles, Pearson Education, 2003.

REFERENCE BOOKS:
1. Operating Systems : Internal and Design Principles - Stallings, 6th ed., PE.
2. Modern Operating Systems, Andrew S Tanenbaum 3rd ed., PE.
3. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 7th ed.,, John Wiley
4. UNIX User Guide – Ritchie & Yates.
5. UNIX Network Programming - W.Richard Stevens ,1998, PHI.
6. The UNIX Programming Environment – Kernighan & Pike, PE.

COMPUTER SYSTEM DESIGN
(OPEN ELECTIVE-I)

UNIT I

Computer structure – hardware, software, system software, Von-Neumann architecture – case study. IA -32 Pentium: registers and addressing, instructions, assembly language, program flow control, logic and shift/rotate instructions, multiply, divide MMX, SIMD instructions, I/O operations, subroutines.
Input/output organization, interrupts, DMA, Buses, Interface circuits, I/O interfaces, device drivers in windows, interrupt handlers

UNIT II

Processing Unit: Execution of a complete instruction, multiple bus organization, hardwired control, micro programmed control.
Pipelining: data hazards, instruction hazards, influence on instruction sets, data path & control consideration, and RISC architecture introduction.

UNIT – III

Memory: types and hierarchy, model level organization, cache memory, performance considerations, mapping, virtual memory, swapping, paging, segmentation, replacement policies.

UNIT – IV

Processes and Threads: processes, threads, inter process communication, classical IPC problems, Deadlocks.

UNIT – V

File system: Files, directories, Implementation, Unix file system
Security: Threats, intruders, accident data loss, basics of cryptography, user authentication.

TEXT BOOKS:
1. Computer Organization – Car Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Modern Operating Systems, Andrew S Tanenbaum 2nd edition Pearson/PHI

REFERENCE BOOKS:
1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson /PHI
2. Morris Mano- Computer System Architecture –3rd Edition-Pearson Education.
3. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
4. Operating Systems – Internals and Design Principles Stallings, Fifth Edition–2005, Pearson Education/PHI

WEB SERVICES AND SERVICE ORIENTED ARCHITECTURE
(OPEN ELECTIVE-I)

UNIT I

Evolution and Emergence of Web Services – Evolution of distributed computing. Core distributed computing technologies – client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.

UNIT II

Web Service Architecture – Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services. Describing Web Services – WSDL introduction, non functional service description, WSDL1.1 Vs WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL port type, limitations of WSDL.

UNIT III

Brief Over View of XML – XML Document structure, XML namespaces, Defining structure in XML Documents, Reuse of XML schemes, Document navigation and transformation. SOAP : Simple Object Access Protocol, Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP envelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging, The enterprise Service Bus, SOA Development Lifecycle, SOAP HTTP binding, SOAP communication model, Error handling in SOAP.

UNIT IV

Registering and Discovering Services : The role of service registries, Service discovery, Universal Description, Discovery, and Integration, UDDI Architecture, UDDI Data Model, Interfaces, UDDI Implementation, UDDI with WSDL, UDDI specification, Service Addressing and Notification, Referencing and addressing Web Services, Web Services Notification.

UNIT V

SOA and web services security considerations, Network-level security mechanisms, Application-level security topologies, XML security standards, Semantics and Web Services, The semantic interoperability problem, The role of metadata, Service metadata, Overview of .NET and J2EE, SOA and Web Service Management, Managing Distributed System, Enterprise management Framework, Standard distributed management frameworks, Web service management, Richer schema languages, WS-Metadata Exchange.

TEXT BOOKS:
1. Web Services & SOA Principles and Technology, Second Edition, Michael P. Papazoglou.
2. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India.
3. Developing Enterprise Web Services, S. Chatterjee, J. Webber, Pearson Education.

REFERENCE BOOKS:
1. XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education.
2. Building web Services with Java, 2nd Edition, S. Graham and others, Pearson Education.
3. Java Web Services, D.A. Chappell & T. Jewell, O'Reilly, SPD.
4. McGovern, et al., "Java web Services Architecture", Morgan Kaufmann Publishers, 2005.
5. J2EE Wer Services, Richard Monson-Haefel, Pearson Education.

ADVANCED SIGNAL PROCESSING LAB-I

Note:

A. Minimum of 10 Experiments have to be conducted

B. All Experiments may be Simulated using MATLAB and to be verified theoretically.

1. Basic Operations on Signals, Generation of Various Signals and finding its FFT.
2. Program to verify Decimation and Interpolation of a given Sequences.
3. Program to Convert CD data into DVD data
4. Generation of Dual Tone Multiple Frequency (DTMF) Signals
5. Plot the Periodogram of a Noisy Signal and estimate PSD using Periodogram and Modified Periodogram methods
6. Estimation of Power Spectrum using Bartlett and Welch methods
7. Verification of Autocorrelation Theorem
8. Parametric methods (Yule-Walker and Burg) of Power Spectrum Estimation
9. Estimation of data series using Nth order Forward Predictor and comparing to the Original Signal
10. Design of LPC filter using Levinson-Durbin Algorithm
11. Computation of Reflection Coefficients using Schur Algorithm
12. To study Finite Length Effects using Simulink
13. Design and verification of Matched filter
14. Adaptive Noise Cancellation using Simulink
15. Design and Simulation of Notch Filter to remove 60Hz Hum/any unwanted frequency component of given Signal (Speech/ECG)

ADHOC -WIRELESS NETWORKS

UNIT -I:
Wireless LANS and PANS: Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, Home RF.
AD HOC Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks.

UNIT -II:
MAC Protocols: Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT -III:
Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

UNIT –IV:
Transport Layer Protocols: Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT –V:
Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

TEXT BOOKS:
1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI.
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control - Jagannathan Sarangapani, CRC Press.
REFERENCE BOOKS:
1. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh , 1st Ed. Pearson Education.
2. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer.

CODING THEORY AND TECHNIQUES

UNIT –I:
Coding for Reliable Digital Transmission and Storage: Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.
Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT –II:
Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT –III:
Convolutional Codes: Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT –IV:
Burst –Error-Correcting Codes: Decoding of Single-Burst error Correcting Cyclic codes, Single-Burst-Error-Correcting Cyclic codes, Burst-Error-Correcting Convolutional Codes, Bounds on Burst Error-Correcting Capability, Interleaved Cyclic and Convolutional Codes, Phased-Burst –Error-Correcting Cyclic and Convolutional codes.

UNIT -V:
BCH – Codes: BCH code- Definition, Minimum distance and BCH Bounds, Decoding Procedure for BCH Codes- Syndrome Computation and Iterative Algorithms, Error Location Polynomials and Numbers for single and double error correction

TEXT BOOKS:
1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello, Jr.Prentice Hall, Inc.
2. Error Correcting Coding Theory-Man Young Rhee- 1989, McGraw-Hill Publishing.
REFERENCE BOOKS:
1. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
2. Digital Communications- John G. Proakis, 5th Ed., 2008, TMH.
3. Introduction to Error Control Codes-Salvatore Gravano-oxford
4. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, 2006, Wiley India.
5. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Ed, 2009, TMH.

MULTIRATE SIGNAL PROCESSING

Unit-I
Fundamentals of Multirate Theory: The sampling theorem - sampling at sub-Nyquist rate - Basic Formulations and schemes. Basic Multirate operations- Decimation and Interpolation - Digital Filter Banks- DFT Filter Bank- Identities- Poly-phase representation (c) Maximally decimated filter banks: Poly-phase representation, Errors in the QMF bank, Perfect reconstruction (PR) QMF Bank, Design of an alias free QMF Bank.

Unit-II
M-channel perfect reconstruction filter banks: Uniform band and non uniform filter bank - tree structured filter bank- Errors created by filter bank system- Poly-phase representation- perfect reconstruction systems –

Unit-III
Perfect reconstruction (PR) filter banks: Para-unitary PR Filter Banks- Filter Bank Properties induced by para-unitarity- Two channel FIR para-unitary QMF Bank- Linear phase PR Filter banks- Necessary conditions for Linear phase property- Quantization Effects: -Types of quantization effects in filter banks. - coefficient sensitivity effects, dynamic range and scaling.

Unit-IV
Cosine Modulated filter banks: Cosine Modulated pseudo QMF Bank- Alas cancellation- phase - Phase distortion- Closed form expression- Poly-phase structure- PR System

Unit-V
Introduction to Wavelet Transforms: Short time Fourier Transform, Cabor Transform, Wavelet Transform, Recursive multi resolution decomposition, Haar wavelet, Digital Filter implementation of the Haar wavelet.

TEXT BOOKS:

1. Robert Cristi, "Modern Digital Signal Processing," Thomson Books, 2004.
2. F.J. Harris, "Multirate Signal Processing for Communication Systems," PHI, 2004.
3. N.J. Fliege, "Multirate Digital Signal Processing", John Wiley 1994.

REFERENCE BOOKS:

1. E.C. Ifeachor and B.W.Jervis, Digital Signal Processing: A Practical Approach, Addison-Wesley, 1993.
2. Sanjit K. Mitra, "Digital Signal Processing", TMH, 1998.

HARDWARE- SOFTWARE CO- DESIGN
(ELECTIVE -III)

UNIT –I
CO- DESIGN ISSUES
Co- Design Models, Architectures, Languages, A Generic Co-design Methodology.
CO- SYNTHESIS ALGORITHMS :
Hardware software synthesis algorithms: hardware – software partitioning distributed system cosynthesis.

UNIT –II
PROTOTYPING AND EMULATION:
Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure
TARGET ARCHITECTURES:
Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051-Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

UNIT – III
COMPILATION TECHNIQUES AND TOOLS FOR EMBEDDED PROCESSOR
ARCHITECTURES:
Modern embedded architectures, embedded software development needs, compilation technologies practical consideration in a compiler development environment.

UNIT – IV
DESIGN SPECIFICATION AND VERIFICATION:
Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, interface verification

UNIT – V
LANGUAGES FOR SYSTEM – LEVEL SPECIFICATION AND DESIGN-I
System – level specification, design representation for system level synthesis, system level specification languages,
LANGUAGES FOR SYSTEM – LEVEL SPECIFICATION AND DESIGN-II
Heterogeneous specifications and multi language co-simulation the cosyma system and lycos system.

TEXT BOOKS :
1. Hardware / software co- design Principles and Practice – Jorgen Staunstrup, Wayne Wolf – 2009, Springer.
2. Hardware / software co- design Principles and Practice, 2002, kluwer academic publishers

EMBEDDED REAL TIME OPERATING SYSTEMS
(ELECTIVE -III)

UNIT –I:
Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec.

UNIT -II:
Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects,Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage,
Operations and Use

UNIT -III:
Objects, Services and I/O: Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

UNIT -IV:
Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

UNIT -V:
Case Studies of RTOS: RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, Tiny OS and Android OS.

TEXT BOOKS:
1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011.
REFERENCE BOOKS:
1. Embedded Systems- Architecture, Programming and Design - Rajkamal, 2007, TMH.
2. Advanced UNIX Programming - Richard Stevens.
3. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh.

WIRELESS CHANNEL CODING
(ELECTIVE -III)

Unit-I Overview of wireless communications. Characterization of wireless channels: Path Loss and shadowing models, Statistical fading models, Narrowband/Wideband fading models. Capacity of Wireless Channels. Performance of Digital Modulation. Diversity in Fading Channels.

Unit-II Multiple Antenna and Space-Time Communications: Narrowband MIMO Model, Parallel Decomposition of MIMO Channel, MIMO diversity Gain: Beam forming, Space-Time modulation and coding. Frequency-Selective MIMO communications, Smart Antennas, MIMO Channel Capacity.

Unit-III Coding for Wireless Channels: Channel Coding and its potential. Coding in a signal space. Coded modulation and coding with interleaving. Basic error control coding & concerned mathematics. Linear block codes, Cyclic codes, BCH and Reed-Solomon codes.

Unit-IV Trellis representation of codes, Coding on a trellis, Convolutional Codes, Trellis coded modulation. Codes on graphs and Concatenated codes. Turbo Codes and LDPC codes.

Unit-V Adaptive modulation and coding: Adaptive techniques, Variable-Rate Variable-Power MQAM: adaptive rate and power techniques, Adaptive coded modulation, adaptive techniques in combined fast and slow fading.

TEXT BOOKS:
1. Ezio Biglieri, "Coding for Wireless Channels," Springer, 2005.
2. D.Tse, and P. Viswanath, "Fundamentals of Wireless Communication," CUP, 2005.
3. A. Goldsmith, "Wireless Communications," CUP, 2005.
4. M.K. Simon and M.S. Alouini, "Digital Communication over Fading channels: A Unified approach to performance analysis," Wiley, 2000.
5. Theodore S. Rapport, "Wireless Communications- Principles and practice," 2/e, PHI, 2002.

MOBILE COMPUTING TECHNOLOGIES
(ELECTIVE -IV)

Unit – I: Introduction to Mobile Computing Architecture

Mobile Computing – Dialog Control – Networks – Middleware and Gateways – Application and Services – Developing Mobile Computing Applications – Security in Mobile Computing – Architecture for Mobile Computing – Three Tier Architecture – Design considerations for Mobile Computing – Mobile Computing through Internet – Making existing Applications Mobile Enabled.

Unit – II: CellularTechnologies: GSM, GPS, GPRS, CDMA and 3G

Bluetooth – Radio Frequency Identification – Wireless Broadband – Mobile IP – Internet Protocol Version 6 (IPv6) – Java Card – GSM Architecture – GSM Entities – Call Routing in GSM – PLMN Interfaces – GSM addresses and Identifiers – Network aspects in GSM – Authentication and Security – Mobile computing over SMS – GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS – Applications for GPRS – Limitations of GPRS – Spread Spectrum technology – Is-95 – CDMA Versus GSM – Wireless Data – Third Generation Networks – Applications on 3G

Unit – III: Wireless Application Protocol (WAP) and Wireless LAN

WAP – MMS – Wireless LAN Advantages – IEEE 802.11 Standards – Wireless LAN Architecture – Mobility in wireless LAN

Intelligent Networks and Interworking

Introduction – Fundamentals of Call processing – Intelligence in the Networks – SS#7 Signaling – IN Conceptual Model (INCM) – softswitch – Programmable Networks – Technologies and Interfaces for IN

Unit – IV: Client Programming, Palm OS,Symbian OS, Win CE Architecture

Introduction – Moving beyond the Desktop – A Peek under the Hood: Hardware Overview – Mobile phones – PDA – Design Constraints in Applications for Handheld Devices – Palm OS architecture – Application Development – Multimedia – Symbian OS Architecture – Applications for Symbian, Different flavors of Windows CE -Windows CE Architecture

J2ME

JAVA in the Handset – The Three-prong approach to JAVA Everywhere – JAVA 2 Micro Edition (J2ME) technology – Programming for CLDC – GUI in MIDP – UI Design Issues – Multimedia – Record Management System – Communication in MIDP – Security considerations in MIDP – Optional Packages

Unit – V: Voice over Internet Protocol and Convergence

Voice over IP- H.323 Framework for Voice over IP – Session Initiation Protocol – Comparision between H.323 and SIP – Real Time protocols – Convergence Technologies – Call Routing – Voice over IP Applications – IP multimedia subsystem (IMS) – Mobile VoIP

Security Issues in Mobile Computing

Introduction – Information Security – Security Techniques and Algorithms – Security Protocols –
Public Key Infrastructure – Trust – Security Models – Security frameworks for Mobile
Environment

TEXT BOOKS:

1. Mobile Computing – Technology, Applications and Service Creation – Asoke K
Talukder, Roopa R Yavagal, 2009, TATA McGraw Hill
2. Mobile Communications – Jochen Schiller – 2nd Edition – Pearson Education

REFERENCES:

1. The CDMA 2000 System for Mobile Communications – Vieri Vaughi, Alexander Damn
Jaonvic – Pearson
2. ADALESTEIN : Fundamentals of Mobile & Parvasive Computing, 2008, TMH

SYSTEM ON CHIP ARCHITECTURE
(ELECTIVE -IV)

UNIT –I:
Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing, System level interconnection, An approach for SOC Design, System Architecture and Complexity.

UNIT –II:
Processors: Introduction, Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT –III:
Memory Design for SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I , and D – Caches, Multilevel Caches, Virtual to real translation, SOC Memory System, Models of Simple Processor – memory interaction.

UNIT -IV:
Interconnect Customization and Configuration: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses , Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance-Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

UNIT –V:
Application Studies / Case Studies: SOC Design approach, AES algorithms, Design and evaluation, Image compression – JEPG compression.

TEXT BOOKS:
1. Computer System Design System-on-Chip - Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.
2. ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.

REFERENCE BOOKS:
1. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer
2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM
3. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

ARRAY SIGNAL PROCESSING
(ELECTIVE -IV)

Unit-I Spatial Signals: Signals in space and time. Spatial frequency, Direction vs. frequency. Wave fields. Far field and Near field signals.

Unit-II Sensor Arrays: Spatial sampling, Nyquist criterion. Sensor arrays. Uniform linear arrays, planar and random arrays. Array transfer (steering) vector. Array steering vector for ULA. Broadband arrays.

Unit- III Spatial Frequency : Aliasing in spatial frequency domain. Spatial Frequency Transform, Spatial spectrum. Spatial Domain Filtering. Beam Forming. Spatially white signal.

Unit-IV Direction of Arrival Estimation : Non parametric methods - Beam forming and Capon methods. Resolution of Beam forming method

Unit-V Subspace methods: Subspace methods - MUSIC, Minimum Norm and ESPRIT techniques. Spatial Smoothing.

Text Books:
1. Don H. Johnson and Dan E. Dugeon, "Array Signal Processing: Concepts and Techniques," PHI, 2010.
2. Prabhakar S. Naidu, "Sensor Array Signal Processing," 2/e, CRC Press, 2009.
3. Simon Haykin, "Array Signal Processing," PHI, 1984.
4. Petre Stoica and Randolph L. Moses, "Spectral Analysis of Signals," PHI, 2005.

NATURAL LANGUAGE PROCESSING
(OPEN ELECTIVE-II)

UNIT I

Introduction and Overview What is Natural Language Processing, hands-on demonstrations. Ambiguity and uncertainty in language. The Turing test.

Regular Expressions Chomsky hierarchy, regular languages, and their limitations. Finite-state automata. Practical regular expressions for finding and counting language phenomena. A little morphology. Exploring a large corpus with raged tools. P**rogramming in Python** An introduction to programming in Python. Variables, numbers, strings, arrays, dictionaries, conditionals, iteration. The NLTK (Natural Language Toolkit)

String Edit Distance and Alignment Key algorithmic tool: dynamic programming, a simple example, use in optimal alignment of sequences. String edit operations, edit distance, and examples of use in spelling correction, and machine translation.

UNIT II

Context Free Grammars Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing, bottom-up parsing, and the problems with each. The desirability of combining evidence from both directions

Non-probabilistic Parsing Efficient CFG parsing with CYK, another dynamic programming algorithms. Early parser. Designing a little grammar, and parsing with it on some test data.

Probability Introduction to probability theory Joint and conditional probability, marginals, independence, Bayes rule, combining evidence. Examples of applications in natural language.

Information Theory The "Shannon game"--motivated by language! Entropy, cross entropy, information gain. Its application to some language phenomena.

UNIT III

Language modeling and Naive Bayes

Probabilistic language modeling and its applications. Markov models. N-grams. Estimating the probability of a word, and smoothing. Generative models of language. Part of Speech Tagging and Hidden Markov Models**,** Viterbi Algorithm for Finding Most Likely HMM Path Dynamic programming with Hidden Markov Models, and its use for part-of-speech tagging, Chinese word segmentation, prosody, information extraction, etc.

UNIT IV

Probabilistic Context Free Grammars

Weighted context free grammars. Weighted CYK. Pruning and beam search.

Parsing with PCFGs

A tree bank and what it takes to create one. The probabilistic version of CYK. Also: How do humans parse? Experiments with eye-tracking. Modern parsers.

Maximum Entropy Classifiers

The maximum entropy principle and its relation to maximum likelihood. Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks

UNIT V

Maximum Entropy Markov Models & Conditional Random Fields

Part-of-speech tagging, noun-phrase segmentation and information extraction models that combine maximum entropy and finite-state machines. State-of-the-art models for NLP.

Lexical Semantics Mathematics of Multinomial and Dirichlet distributions, Dirichlet as a smoothing for multinomial's.

Information Extraction & Reference Resolution- Various methods, including HMMs. Models of anaphora resolution. Machine learning methods for co reference.

TEXT BOOKS:
1. "Speech and Language Processing": Jurafsky and Martin, Prentice Hall
2. "Statistical Natural Language Processing"- Manning and Schutze, MIT Press
3. *"Natural Language Understanding".* James Allen. The Benajmins/Cummings Publishing Company

REFERENCES BOOKS:
1. Cover, T. M. and J. A. Thomas: Elements of Information Theory. Wiley.
2. Charniak, E.: Statistical Language Learning. The MIT Press.
3. Jelinek, F.: Statistical Methods for Speech Recognition. The MIT Press.
4. Lutz and Ascher - "Learning Python", O'Reilly

ADVANCED NETWORK PROGRAMMING
(OPEN ELECTIVE-II)

UNIT – I

Linux Utilities- File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities. Bourne again shell(bash) - Introduction, pipes and redirection, here documents, running a shell script,

the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples. Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

UNIT - II

Files- File Concept, File types File System Structure, Inodes, File Attributes, file I/O in C using

system calls, kernel support for files, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions- chmod, fchmod, file ownership-chown, lchown , fchown, linkssoft links and hard links – symlink, link, unlink. File and Directory management – Directory contents, Scanning Directories- Directory file APIs. Process- Process concept, Kernel support for process, process attributes. Process control – process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process.

UNIT - III

Signals- Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions. Interprocess Communication - Introduction to IPC mechanisms, Pipes- creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions, Introduction to message queues, semaphores and shared memory.

Message Queues- Kernel support for messages, UNIX system V APIs for messages, client/server example. Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores.

UNIT – IV

Shared Memory- Kernel support for shared memory, UNIX system V APIs for shared memory,

client/server example. Network IPC - Introduction to Unix Sockets, IPC over a network, Client-Server model ,Address formats(Unix domain and Internet domain), Socket system calls for Connection Oriented - Communication, Socket system calls for Connectionless-Communication, Example-Client/Server Programs- Single Server-Client connection, Multiple simultaneous clients, Socket options – setsockopt, getsockopt, fcntl.

UNIT-V

Network Programming in Java-Network basics, TCP sockets, UDP sockets (datagram sockets), Server programs that can handle one connection at a time and multiple connections (using multithreaded server), Remote Method Invocation (Java RMI)-Basic RMI Process, Implementation details-Client-Server Application.

TEXT BOOKS:

1. Unix System Programming using C++, T.Chan, PHI.(Units II,III,IV)
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.(Unit I)
3. An Introduction to Network Programming with Java, Jan Graba, Springer, rp 2010.(Unit V)
4. Unix Network Programming ,W.R. Stevens, PHI.(Units II,III,IV)
5. Java Network Programming,3rd edition, E.R. Harold, SPD, O'Reilly.(Unit V)

REFERENCE BOOKS:

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.
3. UNIX for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson Education.
4. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition.
5. Unix Network Programming The Sockets Networking API, Vol.-I,W.R.Stevens, Bill Fenner, A.M.Rudoff, Pearson Education.
6. Unix Internals, U.Vahalia, Pearson Education.
7. Unix shell Programming, S.G.Kochan and P.Wood, 3rd edition, Pearson Education.
8. C Programming Language, Kernighan and Ritchie, PHI

GRID AND CLOUD COMPUTING
(Open Elective-II)

UNIT-I

System models for advanced computing –clusters of cooperative computing, grid computing and cloud computing; software systems for advanced computing-service oriented software and parallel and distributed programming models with introductory details, Features of grid and cloud platform.

UNIT-II

Cloud Computing services models and features in Saas, Paas and Iaas.
Service oriented architecture and web services; Features of cloud computing architectures and simple case studies.

UNIT-III

Virtualization- Characteristic features, Taxonomy Hypervisor, Virtualization and Cloud Computing, Pros and Cons of Cloud Computing, Technology Examples/Case Studies.

UNIT-IV

Cloud programming Environmental- Map Reduce Hadoop Library from Apache, Open Source Cloud Software Systems –Eucalyptus.

UNIT-V

Grid Architecture and Service modeling, Grid resource management, Grid Application trends.

TEXT BOOKS:
1. Distributed and Cloud Computing, Kaittwang Geoffrey C.Fox and Jack J Dongrra, Elsevier India 2012.
2. Mastering Cloud Computing- Raj Kumar Buyya, Christian Vecchiola and S.Tanurai Selvi, TMH, 2012.

REFERENCE BOOKS:
1. Cloud Computing, John W. Ritting House and James F Ramsome, CRC Press, 2012.
2. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2012.

ADVANCED SIGNAL PROCESSING LAB - II

Note:
A. Minimum of 10 Experiments have to be conducted
B. All Simulations are be carried out using MATLAB/DSP Processors/Labview
Software & DSP Kits

1. Study of various addressing modes of DSP using simple programming examples
2. Generation of waveforms using recursive/filter methods
3. Sampling of input signal and display
4. Implementation of Linear and Circular Convolution for sinusoidal signals
5. Framing & windowing of speech signal.
6. Finding voiced & unvoiced detection for each frame of speech signal.
7. IIR Filter implementation using probe points
8. Implementation of FIR filters on DSP processor
9. Loop back using DSK kit
10. Real time signal enhancement using Adaptive Filter.
11. Representation of different Q-formats using GEL function
12. Verification of Finite word length effects (Overflow, Coefficient Quantization, Scaling and Saturation mode in DSP processors)
13. Image enhancement using spatial & frequency domain
14. Implementation of Image segmentation techniques
15. Extraction of frames from Video signal