

G.Narayanamma Institute of Technology & Science (for women)  
(Autonomous)  
(With Effect from 2012-13)

DEPARTMENT OF ELECTRONICS & TELEMATICS ENGINEERING

ACADEMIC REGULATIONS  
COURSE STRUCTURE  
AND  
DETAILED SYLLABUS

**FOR**

**M. Tech. (Wireless & Mobile Communications)**  
(with effect from 2012- 13)

G.NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE  
(For Women)  
(Autonomous)

Shaikpet, Hyderabad - 500 008 AP.

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M.TECH(WIRELESS & MOBILE COMMUNICATIONS)

ACADEMIC REGULATIONS 2012-13 for M.Tech (Regular) Degree Course

(Effective for the Students admitted in to first year from the academic year 2012-2013)

The M.Tech Degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the Program and fulfill all the requirements for the award of the Degree.

**ELIGIBILITY FOR ADMISSIONS:**

Admission to the above subject are as per the eligibility, qualifications and specialization prescribed by the University from time to time.

Admissions shall be made on the basis of merit rank obtained by the eligible candidate at an Entrance test conducted by the University or on the basis of any other order of merit of GATE or AP-PGECET etc. approved by the University in accordance to reservations prescribed by the University 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 she pursues a course of study and completes it successfully within TWO academic years but not more than four academic years from the date of registration.

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

2.3 The minimum instruction for each semester will be 90 instruction days.

**3.0 A. COURSE OF STUDY:**

The following specializations are offered at present for the M.Tech course of study.

1. Power Electronics and Electric Drives in EEE
2. Computer Science and Engineering in CSE
3. Digital Electronics and Communication Engineering in ECE  
and any other course as approved by the authorities of the University/ AICTE from time to time
4. Wireless and Mobile Communications in ETM

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5. Computer Networks and Information Security in IT

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

EEE	Power Electronics and Electric Drives
ECE	Digital Electronics and Communication Engineering.
CSE	Computer Science Engineering
ETM	Wireless and Mobile Communications
IT	Computer Networks and Information Security

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#### 4.0 ATTENDANCE:

1. The programs are offered on a unit basis with each subject being considered as one unit.
2. A candidate shall be deemed to be eligible to write end semester examinations in any subject if she has put in at least 75% of attendance in that subject.
3. Shortage of attendance up to 10% in any subject (i.e. 65% and above and below 75%) may be condoned by the College Academic Committee on genuine and valid reasons on representation by the **candidate** with supporting medical certificate from a registered doctor.
4. A candidate shall get minimum required attendance at least in three (3) theory subjects in the present semester to get promoted to the next semester. In order to qualify for the award of the **M.Tech.** Degree, the candidate shall complete all the academic requirements of the subjects, and pass as per the course structure.
5. Shortage of attendance below 65% shall **in no case be condoned**.
6. A stipulated fee shall be payable towards condonation of shortage of attendance.

#### 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.

- 5.1 For the theory subjects 60 marks shall be awarded based on the performance in the End Semester Examination, 40 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the better of the marks secured in the two Mid Term-Examinations conducted the first mid to be conducted during 7<sup>th</sup> to 9<sup>th</sup> week of the Semester and the other immediately after the completion of instruction. Each mid term examination shall be conducted for a duration of 120 minutes with 4 questions to be answered out of 6 questions.
- 5.2 For practical subjects, 60 marks shall be awarded based on the performance in the End **Semester** Examinations, 40 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 one seminar and the second seminar in II Semester. For seminar, a student should take guidance under the supervision of a faculty member, to 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

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presentation before the Departmental Committee. The Departmental Committee consists 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% to be declared successful.

- 5.4 There shall be a Comprehensive Viva-Voce in II year I Semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is aimed to assess the students' understanding in various subjects she studies during the M.Tech course of study. The Comprehensive Viva-Voce is valued for 100 marks by the Committee. There are no internal marks for the Comprehensive viva-Voce
- 5.5 A candidate shall be deemed to have secured the minimum academic requirement in a subject if She 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.
- 5.6 In case the candidate does not secure the minimum academic requirement in any subject (as specified in(5.5) she has to reappear for the End Examination in that subject. A candidate shall be given only one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and she has failed in the end examination. In such case candidate must re-register for the subject(s) and secure required minimum attendance. Attendance in the re-registered subject(s) has to be calculated separately to become eligible to write the end examination in the re-registered subject(s). The attendance of re-registered subject(s) shall be calculated separately to decide her the eligibility for writing the end examination in those subject(s)as mentionedat point 4.0 attendance . In the event of taking another chance, the internal marks and end examination marks obtained in the previous attempt are nullified.
- 5.7 In case the candidate secures less than the required attendance in any subject(s), She shall not be permitted to appear for the End Examination in that subject(s). She 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 Laboratory Class Teacher and second examiner will nominated by the principle/ Director from the from the panel suggested by HOD..

**6.0 EVALUATION OF PROJECT / DISSERTATION WORK:**

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

- 6.1 A Project Review Committee (PRC) shall be constituted by the Principal/ Director as chair, is the convener , HOD and other HODS of M.Tech offering 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 (theory and practical subjects).
- 6.3 After satisfying 6.2, a candidate has to submit, in consultation with her project supervisor, the title, objective and plan of action of her project work to the Departmental Committee for its approval. Only after obtaining the approval of Departmental Committee the student can initiate the Project work.
- 6.4 If a candidate wishes to change her supervisor or topic of the project she can do so with approval of Departmental Committee. However, the Departmental Committee shall examine whether the change of topic/supervisor leads to a major change of her initial plans of project proposal, If so, her date of registration for the project work start; from the date of change of Supervisor or topic as the case may be.
- 6.5 A candidate shall submit status report (in a bound/Spiral form) in two stages at least with a gap of 3 months between them.
- 6.6 The work of project shall be initiated in the beginning of the second year and the duration of the project is for two semesters. A candidate is permitted to submit Project Thesis only after successful completion of theory and practical course with 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/ Director (through Head of the Department) and shall 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 Principal/Director. For that, the head of the concerned department shall submit a panel of 5 examiners, who are eminent in that field with the help of the concerned guide.
- 6.9 If the report of the examiner is not favorable, the candidate shall revise and resubmit the Thesis, in the time frame as described by PRC. If the report of the examiner is unfavorable

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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 candidates work as:

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

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 will retake the viva-voce examination after three months, If she fails to get a satisfactory report at the second viva-voce examination, she will not be eligible for the award of the degree.

**7.0 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 M Tech. Degree she shall be placed in one of the following four classes:

Class A awarded	% of marks <i>to he</i> secured
First Class with Distinction	70% and above
First Class	Below 70% but not less than 60%
Second Class	Below 60% but not le.ss than 50%
Pass Class	Below 50% but not less than 40%

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

**8.0) WITHHOLDING OF RESULTS:**

If the candidate has not paid *any* dues to the college/ University or if any case of in-discipline is pending against her, the result of the candidate will be withheld and he / she will not be allowed into the next higher semester.

The issue of the degree is liable to be withheld in such cases.

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**9.0) TRANSITORY REGULATIONS:**

Candidate who have discontinued Or have been detained for want of attendance or who have failed after having undergone the course are eligible-for admission to the same or equivalent subjects as and when subjects are offered, subject to 5.5 and 2.0

**10.0 GENERAL:**

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

10.2 In case of any doubt or ambiguity in the interpretation of the above rules , the decision of Director is final.

10.3 The college may change or amend the academic regulations and syllabus at any time and the changes and amendments made shall be applicable to all the students with effect from the date notified by the college.



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MALPRACTICES RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper	Punishment
	<i>If the candidate:</i>	
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 she is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used <b>as</b> 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 <b>hall</b> and cancellation of the performance in <b>that subject</b> only of all the candidates involved. In case of an outsider, she will be handed over to the police and a case is registered against her.
2.	Has copied material 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/year. The Hall Ticket of the candidate is to be cancelled and sent to the Directors office.

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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 seal. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. 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, she 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 other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted (or the remaining examinations of the subjects of that semester/year. 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.
5.0	Uses 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.

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6.0	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 her person or to any of her relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of her 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 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 the remaining examinations of the subjects of that semester/ year. 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.
7.0	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/year. 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.

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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/year. 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 clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and ail 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 thai semester/year. 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/year)

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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/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

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**COURSE STRUCTURE AND SYLLABUS**

**I YEAR - I Semester**

Code	Group	Subject	L	P	Credits
		Advanced Data Communications	3	0	3
		Wireless Communication System Design	3	0	3
		Advanced Digital Signal Processing	3	0	3
		Telecommunication Switching Systems & Networks	3	0	3
	Elective-I	Image & Video Processing	3	0	3
		Optical Networks			
		CPLD & FPGA Architectures and Applications			
	Elective -II	Network Security & Cryptography	3	0	3
		Satellite Communications			
		Radar Signal Processing			
	Lab	Signal Processing & Communication Lab (Simulation Lab)	0	3	2
		Seminar	-	-	2
		Total Credits (6 Theory + 1 Lab.)			22

**I YEAR - II Semester**

Code	Group	Subject	L	P	Credits
		Coding Theory and Techniques	3	0	3
		Internetworking	3	0	3
		Ad-Hoc Wireless & Sensor Networks	3	0	3
		RF Circuit Design	3	0	3
	Elective -III	Detection and Estimation Theory	3	0	3
		Mobile Computing Technologies			
		Multimedia & Signal Coding			
	Elective -IV	Voice over IP	3	0	3
		Propagation Models for wireless Communications			
		Software Radio			
	Lab	Advanced Communications & Computer Networks Lab	0	3	2
		Seminar	-	-	2
		Total Credits (6 Theory + 1 Lab.)			22

**II YEAR – I Semester**

Code	Group	Subject	L	P	Credits
		Comprehensive Viva	-	-	2
		Project Seminar	0	3	2
		Project Work	-	-	18
		Total Credits			22

**II YEAR – II Semester**

Code	Group	Subject	L	P	Credits
		Project Work and Seminar	-	-	22
		Total Credits			22

**I Year – I Sem. M.Tech (Wireless & Mobile Communications)**  
**ADVANCED DATA COMMUNICATIONS**

**Unit-I:**

**DIGITAL MODULATION:** Introduction, Information Capacity Bits, Bit Rate, Baud, and M-ARY Coding, ASK, FSK, PSK, QAM, 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- Components, Networks, Distributed Processing, Network Criteria- Applications, Protocols and Standards, Standards Organizations- Regulatory Agencies, Line Configuration- Point-to-point- Multipoint, Topology- Mesh- Star- Tree- Bus- Ring- Hybrid Topologies, Transmission Modes- Simplex- Half duplex- Full Duplex, Categories of Networks- LAN, MAN, WAN and Internetworking, Digital Data Transmission- Parallel and Serial, DTE- DCE Interface- Data Terminal Equipment, Data Circuit- Terminating Equipment, Standards EIA 232 Interface, Other Interface Standards, Modems- Transmission Rates.

**Unit-III:**

**ERROR DETECTION AND CORRECTION:** Types of Errors- Single- Bit Error, CRC (Cyclic Redundancy Check)- Performance, Checksum, Error Correction- Single-Bit Error Correction, Hamming Code.

**DATA LINK CONTROL:** Stop and Wait, Sliding Window Protocols.

**DATA LINK PROTOCOLS:** Asynchronous Protocols, Synchronous Protocols, Character Oriented Protocol- Binary Synchronous Communication (BSC) - BSC Frames- Data Transparency, Bit Oriented Protocols – HDLC, Link Access Protocols.

**Unit-IV:**

**SWITCHING:** Circuit Switching- Space Division Switches- Time Division Switches- TDM Bus-Space and Time Division Switching Combinations- Public Switched Telephone Network, Packet Switching- Datagram Approach- Virtual Circuit Approach- Circuit Switched Connection Versus Virtual Circuit Connection, Message Switching.

**MULTIPLEXING:** Time Division Multiplexing (TDM), Synchronous Time Division Multiplexing, Digital Hierarchy, Statistical Time Division Multiplexing.

**Unit-V:**

**MULTIPLE ACCESS:** Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Detection (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).

**TEXT BOOKS:**

1. Data Communication and Computer Networking - B. A.Forouzan, 3<sup>rd</sup> ed., 2008, TMH.
2. Advanced Electronic Communication Systems - W. Tomasi, 5 ed., 2008, PEI.

**REFERENCES:**

1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2. Data and Computer Communications - William Stallings, 8<sup>th</sup> ed., 2007, PHI.
3. Data Communication and Tele Processing Systems - T. Housely, 2<sup>nd</sup> Edition, 2008, BSP.
4. Data Communications and Computer Networks- Brijendra Singh, 2<sup>nd</sup> ed., 2005, PHI.
5. Telecommunication System Engineering – Roger L. Freeman, 4<sup>th</sup> ed., Wiley-Interscience, John Wiley & Sons, 2004.

**I Year – I Sem. M.Tech (Wireless & Mobile Communications)**

**WIRELESS COMMUNICATION SYSTEM DESIGN**

**UNIT-I**

**INTRODUCTION TO WIRELESS COMMUNICATION SYSTEMS:**

Evolution of Mobile Radio Communications, Mobile Radiotelephony in the U.S. Mobile Radio Systems Around the World, Examples of Wireless Communication Systems, Trends in Cellular Radio and Personal Communications, Problems.

**MODERN WIRELESS COMMUNICATION SYSTEMS:**

Second Generation (2G) Cellular Networks, Third Generation (3G) Wireless Networks, Wireless Local Loop (WLL) and LMDS, Wireless Local Area Networks (WLANs), Bluetooth and Personal Area Networks (PANs), Summary, Problems.

**UNIT-II**

**THE CELLULAR CONCEPT & SYSTEM DESIGN FUNDAMENTALS:**

Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems, Summary, Problems.

**UNIT-3**

**MOBILE RADIO PROPAGATION: LARGE-SCALE PATH LOSS.**

Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection., Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Practical Link Budget Design Using Path Loss Models. Outdoor Propagation Models, Indoor Propagation Models, Signal Penetration into Buildings, Ray Tracing and Site Specific Modeling, Problems.

**UNIT-4**

**MOBILE RADIO PROPAGATION: SMALL-SCALE FADING AND MULTIPATH.**

Small-Scale Multipath Propagation, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of Small-Scale Fading, Rayleigh and Ricean Distributions.

**UNIT-5**

**WIRELESS NETWORKING:**

Introduction to Wireless Networks, Differences Between Wireless and Fixed Telephone Networks, Development of Wireless Networks, Fixed Network Transmission Hierarchy, Traffic Routing in Wireless Networks, Wireless Data Services, Common Channel Signaling (CCS), Integrated Services Digital Network (ISDN), Signaling System No. 7 (SS7), An Example of SS7 & Global Cellular Network Interoperability, Personal Communication Services/Networks (PCS/PCNs), Protocols for Network Access, Network Databases, Universal Mobile Telecommunication System (UMTS), Summary.

**TEXT BOOKS:**

1. Wireless communication principles, practice Theodore, S. Rappaport (2002), 2nd Edition, Prentice Hall of India.
2. Wireless communication and networking, William Stallings (2003), Prentice Hall of India, New Delhi.
3. Principles of Wireless networks , Kaveh Pah Laven, P. Krishna Murthy (2002), , Pearson Education, India.

**REFERENCE BOOKS:**

- 1 Wireless Digital communications, Kamilo Feher (1999), Prentice Hall of India, New Delhi.
2. Telecommunication system engineering, Roger I. Freeman (2004), 4th edition, John Wiley & Sons, New Delhi.



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**ADVANCED DIGITAL SIGNAL PROCESSING**

**UNIT I**

Review of DFT, FFT, IIR Filters, FIR Filters,

**MULTIRATE SIGNAL PROCESSING:** Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion, Applications of Multirate Signal Processing

**UNIT II**

**NON-PARAMETRIC METHODS OF POWER SPECTRAL ESTIMATION:** Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman & Tukey methods, Comparison of all Non-Parametric methods

**UNIT III**

**PARAMETRIC METHODS OF POWER SPECTRUM ESTIMATION:** Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Waker & Burg Methods, MA & ARMA models for power spectrum estimation.

**UNIT –IV**

**LINEAR PREDICTION :** Forward and Backward Linear Prediction – Forward Linear Prediction, Backward Linear Prediction, Optimum reflection coefficients for the Lattice Forward and Backward Predictors. Solution of the Normal Equations: Levinson Durbin Algorithm, Schur Algorithm. Properties of Linear Prediction Filters

**UNIT V**

**FINITE WORD LENGTH EFFECTS:** Analysis of finite word length effects in Fixed-point DSP systems – Fixed, Floating Point Arithmetic – ADC quantization noise & signal quality – Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

**TEXTBOOKS:**

1. Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis & D.G.Manolakis, 4<sup>th</sup> ed., PHI.
2. Discrete Time signal processing - Alan V Oppenheim & Ronald W Schaffer, PHI.
3. DSP – A Practical Approach – Emmanuel C.Ifearcher, Barrie. W. Jervis, 2 ed., Pearson Education.

**REFERENCES:**

1. Modern spectral Estimation : Theory & Application – S. M .Kay, 1988, PHI.
2. Multirate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education
3. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya, 2000,TMH

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**TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS**

**UNIT - I**

**INTRODUCTION:** Evolution of telecommunications, simple telephone communication, basics of switching system, manual switching system, major telecommunication networks.

**CROSSBAR SWITCHING:** Principles of common control, touch tone dial telephone, principles of crossbar switching, crossbar switch configurations, cross point technology, crossbar exchange organization.

**UNIT - II**

**ELECTRONIC SPACE DIVISION SWITCHING:** Stored program control, centralized SPC, distributed SPC, software architecture, application software, enhanced services, two-stage networks, three stage networks, n-stage networks.

**TIME DIVISION SWITCHING:** Basic time division space switching, basic time division time switching, time multiplexed space switching, time multiplexed time switching, combination switching, three-stage combination switching n-stage combination switching.

**UNIT - III**

**TELEPHONE NETWORKS:** Subscriber loop system, switching hierarchy and routing, transmission plan, transmission systems, numbering plan, charging plan, signaling techniques, in-channel signaling, common channel signaling, cellular mobile telephony.

**SIGNALING:** Customer line signaling, audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling inter-register signaling, common-channel signaling principles, CCITT signaling system no.6, CCITT signaling system no.7, digital customer line signaling.

**UNIT - IV**

**PACKET SWITCHING:** Statistical multiplexing, local-area and wide- area networks, large-scale networks, broadband networks.

**SWITCHING NETWORKS:** Single-state networks, grading, link systems, grades of service of link systems, application of graph theory to link systems, use of expansion, call packing, rearrangeable networks, strict-sense non-blocking networks, sectionalized switching networks.

**UNIT - V**

**TELECOMMUNICATIONS TRAFFIC:** The unit of traffic, congestion, traffic measurements, a mathematical model, lostcall systems, queuing systems.

**INTEGRATED SERVICES DIGITAL NETWORK:** Motivation for ISDN, new services, network and protocol architecture, transmission channels, user-network interfaces, signaling, numbering and addressing, service characterization, interworking, ISDN standards, expert systems in ISDN, broadband ISDN, voice data integration.

**TEXT BOOKS:**

1. Tele communication switching system and networks Thyagarajan Viswanath (2000), , Prentice Hall of India, New Delhi, India.
2. Telecommunication switching, Traffic and Networks ,J. E. Flood (2006), , Pearson Education, India.

**REFERENCE BOOKS:**

1. Digital telephony,J. Bellamy (2001), 2nd edition, John Wiley and Sons, India.
2. Data Communications & Networks Achyut S. Godbole (2004), , Tata McGraw Hill, India.
3. Principles of Communication Systems, H. Taub, D. Schilling (2003), , 2nd Edition, Tata McGraw Hill, India.
4. Data Communications & Networking, B.A. Forouzan (2004), , 3rd Edition, Tata McGraw Hill, India.
5. Telecommunication System Engineering Roger L. Freeman (2004), , 4th edition, Wiley-Inters, India.

**I Year – I Sem. M.Tech (Wireless & Mobile Communications)**  
**IMAGE & VIDEO PROCESSING**  
**(ELECTIVE – I)**

**UNIT I**

**FUNDAMENTALS OF IMAGE PROCESSING AND IMAGE TRANSFORMS**

Basic steps of Image Processing System Sampling and Quantization of an image – Basic relationship between pixels

Image Transforms: 2 D- Discrete Fourier Transform, Discrete Cosine Transform (DCT), Wavelet Transforms: Continuous Wavelet Transform, Discrete Wavelet Transforms.

**UNIT II I**

**IMAGE PRE PROCESSING TECHNIQUES**

**IMAGE ENHANCEMENT**

Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

**IMAGE SEGMENTATION**

Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region Based segmentation.

**IMAGE COMPRESSION:**

Image compression fundamentals - Coding Redundancy, Spatial and Temporal redundancy, Compression models: Lossy & Lossless, Huffman coding, Arithmetic coding, LZW coding, Run length coding, Bit plane coding, Transform coding, Predictive coding, Wavelet coding, JPEG Standards.

**UNIT III**

**COLOR IMAGE PROCESSING**

**Pseudo color image processing, full color image processing**

**UNIT IV**

**BASIC STEPS OF 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**

**2-D 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, Application of 2D motion estimation.

**TEXTBOOKS**

1. Digital Image Processing – Gonzalez and Woods, 3<sup>rd</sup> ed., Pearson.
2. Video processing and communication – Yao Wang, Joem Ostermann and Ya-quin Zhang. 1<sup>st</sup> Ed., PH Int.

**REFERENCES :**

1. Digital Video Processing – M. Tekalp, Prentice Hall International

**I Year – I Sem. M.Tech (Wireless & Mobile Communications)**

**OPTICAL NETWORKS  
(ELECTIVE - I)**

**UNIT-I**

**CLIENT LAYERS OF OPTICAL NETWORKS**

SNET / SDH- Multiplexing, Frame structure , Physical Layer, Infrastructure, ATM- Functions, Adaptations layers , QoS, Flow Control Signaling and Routing, IP Routing, QoS, MPLS, Storages Area Networks-ESCON Fiber channel. HIPPI, Gigabit Ethernet.

**UNIT-II**

**WDM NETWORK ELEMENTS AND DESIGN**

Optical Line terminals and Amplifiers, Add / Drop Multiplexers, Optical Cross Connects, Cost Trade-offs in Network Design LTD and RWA Problems, Dimensioning- Wavelength Networks, Statistical and Maximum Load Dimensioning Models

**UNIT- III**

**NETWORK CONTROL AND MANAGEMENT**

Network management Functions, Optical Layer Services and Interfacing, Layers within Optical Layer, Multivendor Interoperability, Performance and Fault Management, Configuration management, Optical Safety.

**UNIT-IV**

**NETWORK SURVIVABILITY**

Basic Concepts of Survivability, Protection in SONET / SDH Links and Rings, protection in IP Networks, Optical Layer Protection- Service Classes, Protection Schemes, Interworking between Layers.

**UNIT –V**

**ACCESS NETWORKS AND PHOTONIC PACKET SWITCHING**

Networking Architecture, Enhanced HFC, FTC, Photonic Packet Switching- OTDm, Synchronization, Header Processing, Buffering, Burst Switching, Test Beds.

**Text Books:**

1. Optical Networks: A Practical Perspective- Rajiv Ramaswami and Kumar N. Sivarajan, 2ed., 2004 Elsevier Morgan Kaufmann Publishers(An Imprint of Elseviers).
2. WDM Optical Networks: Concepts Design and Algorithms-C Siva Rama Murthy and Mohan Guruswamy 2ed., 2003, PEI
3. Optical Networks: Third Generation Transport Systems – Uyles Black, 2ed., 2009, PEI

**Reference:**

1. Optics Fiber Communications – Principles and Practice- John.M.Senior, 2ed.,2000,PE
2. Fiber Optics Communication-Harold Kolimbris, 2ed.,2004, PEI
3. Networks – Timothy S. Ramteke, 2ed.,2004, PEI
4. Optical Fiber communication – Govind Agarwal, 2ed., 2004, TNH
5. Optical Fiber Communocations and Its Applications-S.C.Gupta, 2004, PHI
6. Telecommunication System Engineering-Roger L.Freeman, 4/ed., Wiley-Interscience, John Wiley & Sons,2004

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**CPLD AND FPGA ARCHITECTURE AND APPLICATIONS  
(ELECTIVE - I)**

**UNIT –I**

Programmable logic : ROM, PLA, PAL PLD, PGA – Features, programming and applications using complex programmable logic devices Altera series – Max 5000/7000 series and Altera FLEX logic-10000 series CPLD, AMD's- CPLD (Mach 1to 5), Cypress FLASH 370 Device technology, Lattice PLST's architectures – 3000 series – Speed performance and in system programmability.

**UNIT – II**

FPGAs: Field Programmable gate arrays- Logic blocks, routing architecture, design flow technology mapping for FPGAs, Case studies Xilinx XC4000 & ALTERA's FLEX 8000/10000 FPGAs: AT & T ORCA's ( Optimized Reconfigurable Cell Array): ACTEL's ACT-1,2,3 and their speed performance

**UNIT-III**

Alternative realization for state machine using microprogramming linked state machine one –hot state machine, Petri nets for state machines-basic concepts, properties, extended Petri nets for parallel controllers.

**UNIT-IV**

Digital front end digital design tools for FPGAs & ASICs: Using Mentor Graphics EDA tool ("FPGA Advantage") – Design flow using FPGAs

**UNIT - V**

Case studies of parallel adder, carry parallel adder sequential circuits, counters, multiplexers, parallel controllers.

**TEXT BOOKS:**

1. Field Programmable Gate Array Technology - S. Trimberger, Edr, 1994, Kluwer Academic Publications.
2. Field Programmable Gate Arrays, John V. Oldfield, Richard C Dore, Wiley Publications.

**REFERENCE BOOKS :**

1. Digital Design Using Field Programmable Gate Array, P.K.Chan & S. Mourad, 1994, Prentice Hall.
2. Digital System Design using Programmable Logic Devices – Parag.K.Lala, 2003, BSP.
3. Field programmable gate array, S. Brown, R.J.Francis, J.Rose, Z.G.Vranesic, 2007, BSP.
4. Digital Systems Design with FPGA's and CPLDs – Ian Grout, 2009, Elsevier.

**I Year – I Sem. M.Tech (Wireless & Mobile Communications)**

**NETWORK SECURITY AND CRYPTOGRAPHY  
(ELECTIVE- II)**

**UNIT I**

**INTRODUCTION:** Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security. **CLASSICAL TECHNIQUES:** Conventional Encryption model, Steganography, Classical encryption Techniques.

**NUMBER THEORY:** Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, Chinese remainder theorem, Discrete logarithms.

**UNIT II**

**MODERN TECHNIQUES:** Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

**ALGORITHMS:** Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST-128, RC2, Characteristics of Advanced Symmetric block ciphers.

**CONVENTIONAL ENCRYPTION:** Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

**PUBLIC KEY CRYPTOGRAPHY:** Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.

**UNIT III**

Zero Knowledge Protocols, Intermediate Protocols

**MESSAGE AUTHENTICATION AND HASH FUNCTIONS:** Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

**UNIT IV**

**HASH AND MAC ALGORITHMS:** MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD- 160, HMAC. **DIGITAL SIGNATURES AND AUTHENTICATION PROTOCOLS:** Digital signatures, Authentication Protocols, Digital signature standards.

**AUTHENTICATION APPLICATIONS:** Kerberos, X.509 directory Authentication service.

**ELECTRONIC MAIL SECURITY:** Pretty Good Privacy, S/MIME.

**UNIT V**

**IP SECURITY:** Overview, Architecture, Authentication, Encapsulating Security Payload, Combining security Associations, Key Management.

**WEB SECURITY:**

Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.

**INTRUDERS, VIRUSES AND WORMS:** Intruders, Viruses and Related threats.

**FIRE WALLS:** Fire wall Design Principles, Trusted systems.

**TEXT BOOKS**

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education., 2000.
2. Bruce Schneier: [Applied Cryptography](#), Wiley Student Edition, 2<sup>nd</sup> Edition, Singapore, 1996.

**REFERENCE BOOK**

1. Handbook of Applied Cryptography. Alfred Menezes, Paul van Oorschot, and Scott Vanstone: CRC Press, NY.
2. **Principles of Network and Systems Administration**, Mark Burgess, John Wiel

**I Year – I Sem. M.Tech (Wireless & Mobile Communications)**

**SATELLITE COMMUNICATIONS  
(ELECTIVE - II)**

**Unit-I**

**COMMUNICATION SATELLITE: ORBIT AND DESCRIPTION**

A Brief history of satellite Communication, Satellite Frequency Bands, Satellite Systems, Applications, Orbital Period and Velocity, effects of Orbital Inclination, Azimuth and Elevation, Coverage angle and slant Range, Eclipse, Orbital Perturbations, Placement of a Satellite in a Geo-Stationary orbit.

**Unit-II:**

**SATELLITE SUB-SYSTEMS**

Attitude and Orbit Control system, TT&C subsystem, Attitude Control subsystem, Power systems, Communication subsystems, Satellite Antenna Equipment.

**SATELLITE LINK**

Basic Transmission Theory, System Noise Temperature and G/T ratio, Basic Link Analysis, Interference Analysis, Design of satellite Links for a specified C/N, (With and without frequency Re-use).

**Unit-III**

**PROPAGATION EFFECTS**

Introduction, Atmospheric Absorption, Cloud Attenuation, Tropospheric and Ionospheric Scintillation and Low angle fading, Rain induced attenuation, rain induced cross polarization interference.

**FREQUENCY DIVISION MULTIPLE ACCESS**

FDM-FM-FDMA, Single channel per carrier, Companded FDM-FM-FDMA and SSB-AM-FDMA, Intermodulation Products due to Amplitude Non-Linearity and Phase non-linearities, Optimized Carrier to Intermodulation plus noise ratio.

**Unit-IV**

**TIME DIVISION MULTIPLE ACCESS**

TDMA frame Structure, Burst Structure, Frame Efficiency, Super frame structure, Frame Acquisition and Synchronization, Burst Time Plan, TDMA timing, TDMA equipment and Advanced TDMA satellite systems.

**Demand Assignment Multiple Access**

Types of Demand Assignments, DAMA characteristics, Real –Time Frame Configuration, DAMA interfaces, SCPC-DAMA, SPADE.

**Unit-V**

**SATELLITE PACKET COMMUNICATIONS:**

Message Transmission by FDMA:M/G/1 Queue, Message Transmission by TDMA, PURE ALOHA-Satellite Packet Switching, Slotted Aloha, Packet Reservation, Tree Algorithm.

**TEXT BOOKS:**

1. Digital Satellite Communications-Tri.T.Ha, , 2nd Edition, 1990, Mc.Graw Hill.
2. Satellite Communications –Timothy Pratt, Charles Bostian, Jeremy Allnutt, 2<sup>nd</sup> Edition, 2003, John Wiley & Sons.

**REFERENCES:**

1. Satellite Communications-Dennis Roddy, 2<sup>nd</sup> Edition, 1996, Mc-Graw Hill.

**I Year – I Sem. M.Tech (Wireless & Mobile Communications)**

**RADAR SIGNAL PROCESSING  
(ELECTIVE - II)**

**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, Noiselike 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 Sidelobes, 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). Sidelobe Reduction for Phase Coded PC Signals.

**TEXT BOOKS :**

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

**REFERENCES :**

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, 1<sup>st</sup> ed., 1969, McGraw Hill.



**I Year – I Sem. M.Tech (Wireless & Mobile Communications)**

**SIGNAL PROCESSING & COMMUNICATION LAB (SIMULATION LAB)**

**Note:**

- A. Minimum of 10 Experiments have to be conducted
- B. All Experiments may be Simulated using MATLAB and to be verified using related training kits.

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. Estimation of Power Spectrum using Bartlett and Welch methods.
6. Estimation of Power Spectrum using Blackman-Tukey method.
7. Parametric methods (Yule-Walker and Burg) of Power Spectrum Estimation.
8. Design of LPC filters using Levinson-Durbin Algorithm.
9. Measurement of effect of Intersymbol Interference.
10. Simulation of PSK system with  $M=4$
11. Simulation of DPSK system with  $M=4$
12. BPSK Modulation and Demodulation techniques
13. QPSK Modulation and Demodulation techniques
14. DQPSK Modulation and Demodulation techniques
15. 8-QAM Modulation and Demodulation techniques
16. DQAM Modulation and Demodulation techniques

**I Year – II Sem. M.Tech (Wireless & Mobile Communications)**

**CODING THEORY AND TECHNIQUES**

**UNIT I:**

**LINEAR BLOCK & CYCLIC CODES**

**LINEAR BLOCK CODES:** Block diagram of Digital System, Introduction to Linear Block codes, Standard Array, Syndrome decoding, Probability of undetected error, Hamming codes.

**CYCLIC CODES:** Description of cyclic codes, Generator and parity check matrices, Encoding, Syndrome computation, Error detection, Decoding, Cyclic hamming codes, Error trapping decoding, Majority logic decoding

**UNIT-II :**

**CONVOLUTIONAL CODES**

Introduction to convolution codes, Encoding, Structural and Distance properties, Maximum likelihood decoding, Sequential decoding, Majority logic decoding, Viterbi decoding, Applications of Viterbi and sequential decoding, Applications of Convolution codes in ARQ systems

**UNIT-III:**

**BURST ERROR CORRECTING CODES**

Introduction to Burst Error Correcting Codes, Decoding of single Burst Error Correcting cyclic codes, Single Burst error correcting cyclic codes, Burst error correcting convolution codes, Bounds on burst error correcting capability, Interleaved cyclic codes, Interleaved convolution codes, Phased burst error correcting cyclic codes, Phased burst error correcting convolution codes

**UNIT-IV:**

**BCH CODES:** Introduction to BCH codes, Minimum distance and bounds on BCH codes, Decoding procedure for BCH codes, Syndrome computation and iterative algorithm, Error location polynomials, Numbers for single and double error correction

**UNIT-V**

**TURBO & LDPC CODES**

**TURBO CODES:** Turbo coding, Decoding, BCJR Algorithm

**LDPC CODES:** Construction of LDPC Codes, Probabilistic coding, irregular codes

**TEXT BOOKS:**

1. Communication Systems 4<sup>th</sup> edition, wiley publications, 2004
2. Shu Lin, Daniel J. Costello, Jr(1983), Error Control Coding Fundamentals and Applications, Prentice Hall of India, New Delhi.
2. Sal Vatore Gravano (2009), Introduction to Error Control Codes, Oxford University Press, New York.

**REFERENCE BOOKS:**

1. Error correcting coding theory, Man Young Rhee (1989), McGraw Hill publishing, New Delhi.
2. Digital communications fundamental and application, Bernard Sklar, Pabitra Kumar Rey (2009), 2nd edition, Pearson Education.
3. Digital communications, John G. Proakis (2008), , 6th edition, Tata McGraw Hill, New Delhi.

**I Year – II Sem. M.Tech (Wireless & Mobile Communications)**

**INTERNETWORKING**

**Unit -I:**

**INTERNETWORKING CONCEPTS:** Principles of Internetworking, Connectionless Internetworking, Application level Interconnections, Network level Interconnection, Properties of the Internet, Internet Architecture, Wired LANs, Wireless LANs, Point-to-Point WANs, Switched WANs, Connecting Devices, TCP/IP Protocol Suite.

**IP ADDRESS: CLASSFUL ADDRESSING:** Introduction, Classful Addressing, Other Issues, Sub-netting and Super-netting

**IP ADDRESS:** Classless Addressing: - Variable length Blocks, Sub-netting, Address Allocation. Delivery, Forwarding, and Routing of IP Packets: Delivery, Forwarding, Routing, Structure of Router.

**ARP AND RARP:** ARP, ARP Package, RARP.

**Unit -II:**

**INTERNET PROTOCOL (IP):** Datagram, Fragmentation, Options, Checksum, IP V.6.

**TRANSMISSION CONTROL PROTOCOL (TCP):** TCP Services, TCP Features, Segment, A TCP Connection, State Transition Diagram, Flow Control, Error Control, Congestion Control, TCP Times.

**STREAM CONTROL TRANSMISSION PROTOCOL (SCTP):** SCTP Services, SCTP Features, Packet Format, Flow Control, Error Control, Congestion Control.

**MOBILE IP:** Addressing, Agents, Three Phases, Inefficiency in Mobile IP.

**CLASSICAL TCP IMPROVEMENTS:** Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/ Fast Recovery, Transmission/ Time Out Freezing, Selective Retransmission, Transaction Oriented TCP.

**Unit -III:**

**UNICAST ROUTING PROTOCOLS (RIP, OSPF, AND BGP):** Intra and Inter-domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP.

**MULTICASTING AND MULTICAST ROUTING PROTOCOLS:** Unicast - Multicast-Broadcast, Multicast Applications, Multicast Routing, Multicast Link State Routing: MOSPF, Multicast Distance Vector: DVMRP.

**Unit -IV:**

**DOMAIN NAME SYSTEM (DNS):** Name Space, Domain Name Space, Distribution of Name Space, and DNS in the internet.

**REMOTE LOGIN TELNET:-** Concept, Network Virtual Terminal (NVT). **File Transfer FTP and TFTP:** File Transfer Protocol (FTP).

**ELECTRONIC MAIL:** SMTP and POP.

**NETWORK MANAGEMENT-SNMP:** Concept, Management Components. World Wide Web-HTTP Architecture.

**Unit-V:**

**MULTIMEDIA:** Digitizing Audio and Video, Network security, security in the internet firewalls. Audio and Video Compression, Streaming Stored Audio/Video, Streaming Live Audio/Video, Real-Time Interactive Audio/Video, RTP, RTCP, Voice Over IP. Network Security, Security in the Internet, Firewalls.

**TEXT BOOKS:**

1. TCP/IP Protocol Suite- Behrouz A. Forouzan, Third Edition, TMH
2. Internetworking with TCP/IP Comer 3 rd edition PHI

**REFERENCES:**

1. High performance TCP/IP Networking- Mahbub Hassan, Raj Jain, PHI, 2005
2. Data Communications & Networking – B.A. Forouzan – 2<sup>nd</sup> Edition – TMH
3. High Speed Networks and Internets- William Stallings, Pearson Education, 2002.
4. Data and Computer Communications, William Stallings, 7<sup>th</sup> Edition., PEI.

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**I Year – II Sem. M.Tech (Wireless & Mobile Communications)**

**ADHOC WIRELESS AND SENSOR NETWORKS**

**UNIT - I**

**WIRELESS LANS AND PANS:**

Introduction Fundamentals of WLANS, IEEE 802.11 Standard, HIPERLAN Standard, Bluetooth, Home RF.

**WIRELESS INTERNET:** Wireless Internet, Mobile IP, TCP in wireless Domain WAP, Optimizing Web over Wireless.

**UNIT – II**

**ADHOC WIRELESS NETWORKS:**

Introduction in Ad Hoc wireless Networks, AD Hoc Wireless internet.

**MAC PROTOCOLS FOR ADHOC WIRELESS NETWORKS:**

Introduction, issues in designing a MAC protocol for adhoc wireless networks, design goals, classification of MAC protocols, contention based protocols.

**UNIT - III**

**ROUTING PROTOCOLS:** Introduction, issues in designing a routing protocol for adhoc wireless networks, classification, table-driven routing protocols, on-demand routing protocols, hybrid routing protocols, hierarchical routing protocols, power-aware routing protocols.

**TRANSPORT LAYER AND SECURITY PROTOCOLS:** Introduction, issues in designing a transport layer protocol for adhoc wireless networks, design goals of a Transport Layer Protocol for AD Hoc Wireless Networks, classification of Transport Layer Solutions, TCP over adhoc wireless networks, other Transport Layer Protocol for Ad Hoc wireless Networks Security in adhoc wireless networks, network security requirements, issues and challenges in security provisioning, network security attacks, key management, secure routing in Ad Hoc wireless networks.

**UNIT - IV**

**QUALITY OF SERVICE:** Introduction, issues and challenges in providing QoS in adhoc wireless networks, classification of QoS solutions, MAC layer solutions, network layer solutions, QoS frameworks for adhoc wireless networks,.

**ENERGY MANAGEMENT:** Introduction, need for energy management in adhoc wireless networks, classification of energy management schemes, battery management schemes, transmission power management schemes, system power management schemes.

**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. Adhoc wireless networks architecture and protocols, C. Siva Ram Murthy, B.S. Manoj (2004), Prentice Hall of India, New Delhi.
2. Wireless Adhoc and sensor networks, protocols, performance and control, Jagannathan Sarangapani (2007), CRC press, New Delhi.

**REFERENCE BOOKS:**

1. Adhoc mobile wireless networks protocols & systems, C. K. Toh (2009), Pearson Education India, New Delhi.
2. Wireless sensor networks ,C .S. Raghavendra, Krishna M. Sivalingam (2004), Springer Science, USA.

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**RF CIRCUIT DESIGN**

**UNIT I: INTRODUCTION TO RF ELECTRONICS**

The Electromagnetic Spectrum, units and Physical Constants, Microwave bands – RF behavior of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors - Voltage and Current in capacitor circuits – Tuned RF / IF Transformers.

**UNIT II: TRANSMISSION LINE ANALYSIS**

Examples of transmission lines- Transmission line equations and Biasing- Micro Strip Transmission Lines- Special Termination Conditions- sourced and Loaded Transmission Lines.

**SINGLE AND MULTI-PORT NETWORKS**

The Smith Chart, Interconnectivity networks, Network properties and Applications, Scattering Parameters.

**UNIT III: MATCHING AND BIASING NETWORKS**

Impedance matching using discrete components – Micro strip line matching networks, Amplifier classes of Operation and Biasing networks.

**RF PASSIVE & ACTIVE COMPONENTS**

Filter Basics – Lumped filter design – Distributed Filter Design – Diplexer Filters- Crystal and Saw filters- Active Filters - Tunable filters – Power Combiners / Dividers – Directional Couplers – Hybrid Couplers – Isolators. RF Diodes – BJTs- FETs- HEMTs and Models.

**UNIT IV: RF TRANSISTOR AMPLIFIER DESIGN**

Characteristics of Amplifiers - Amplifier Circuit Configurations, Amplifier Matching Basics, Distortion and noise products, Stability Considerations, Small Signal amplifier design, Power amplifier design, MMIC amplifiers, Broadband High Power multistage amplifiers, Low noise amplifiers, VGA Amplifiers.

**UNIT V: OSCILLATORS**

Oscillator basics, Low phase noise oscillator design, High frequency Oscillator configuration, LC Oscillators, VCOs, Crystal Oscillators, PLL Synthesizer, and Direct Digital Synthesizer.

**RF MIXERS**

Basic characteristics of a mixer - Active mixers- Image Reject and Harmonic mixers, Frequency domain considerations.

**TEXT BOOKS:**

1. RF circuit design: Theory and applications by Reinhold Ludwig, Pavel Bretchko. Pearson Education Asia Publication, New Delhi 2001.

**REFERENCES:**

1. Radio frequency and microwave electronics illustrated Mathew M. Radmangh, 2001, PE Asia Publication.
2. Secrets of RF Design by Joseph Carr., 3<sup>rd</sup> Edition, Tab Electronics.
3. Complete Wireless Design by Cotter W. Sawyer, 2<sup>nd</sup> Edition, Mc-Graw Hill.
4. Practical RF Circuit Design for Modern Wireless Systems Vol.2 by Less Besser and Rowan Gilmore.

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**DETECTION & ESTIMATION THEORY  
(ELECTIVE - III)**

**Unit – I**

Introduction, Simple Binary Hypothesis Tests, M-Hypothesis, Estimation Theory, Composite Hypothesis, General Gaussian Problem, Performance Bounds and Approximations, Sampling of Bandlimited Random Signals, Periodic random Processes, Spectral Decomposition, Vector Random Processes.

**Unit – II**

Detection & Estimation of Signals in White Gaussian Noise and Non-White Gaussian Noise, Signals with unwanted Parameters, Multiple Channels and Multiple Parameter, Linear & Non-Linear estimates, MLP & ML Estimates, Maximum Likelihood Estimate of Parameters of Linear Systems

**Unit – III**

Minimum Probability Error Criterion, Neyman-Pearson Criterion for Radar detection of Constant and variable amplitude signals, Matched Filters, Optimum formulation, Detection of Random Signals, Simple Problems there on with Multisample cases.

**Unit – IV**

Estimation of Continuous Waveforms: Derivation of Estimator Equations, A Lower Bound on the Mean Square Estimation Error, Multi dimensional Waveform Estimation, Nonrandom Waveform estimation.

**Unit – V**

Estimation of Time varying Signals – Kalman Filtering, Filtering Signals in Noise treatment, Restricted to two variable case only- simple Problems, Realizable Linear Filters, Kalman Bucy Filters, Fundamental role of Optimum Linear Filters.

**TEXT BOOKS:**

1. Detection, Estimation and Modulation Theory: Part – I – Harry L. Van Trees, 2001, John Wiley & Sons, USA.
2. Signal Processing : Discrete Spectral Analysis – Detection & Estimation – Mischa Schwartz, Leonard Shaw, 1975, McGrawHill.

**REFERENCES:**

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.
4. Statistical Signal Processing: Detection, Estimation and Time Series Analysis – Louis L.Scharf, 1991, Addison Wesley.
5. Random Signals : Detection, Estimation and Data Analysis – K.Sam Shanmugam, Arthur M Breiphol, 1998, John Wiley & Sons.

**I Year – II Sem. M.Tech (Wireless & Mobile Communications)**  
**MOBILE COMPUTING TECHNOLOGIES**  
**(ELECTIVE – III)**

**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**

**CELLULAR TECHNOLOGIES – 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 AND INTERNETWORKING:** 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 flavours 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 – Comparison 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, New Delhi.
2. Mobile Communications Jochen Schiller (2008), 2nd Edition, Pearson Education, New Delhi.

**REFERENCE BOOKS:**

1. The CDMA 2000 system for Mobile Communications, Vieri Vaughn, Alexander Damnjanovic (2007), Pearson Education, New Delhi.
2. Fundamentals of Mobile & Pervasive Computing, Adalestein (2008), Tata McGraw Hill, New Delhi.



**I Year – II Sem. M.Tech (Wireless & Mobile Communications)**

**MULTIMEDIA AND SIGNAL CODING  
(ELECTIVE – III)**

**UNIT 1:**

**INTRODUCTION TO MULTIMEDIA:** Multimedia, World Wide Web, Overview of multimedia tools, Multimedia authoring, Graphics/ image data types, and file formats.

**COLOR IN IMAGE AND VIDEO:** Color Science – Image Formation, Camera Systems, Gamma Correction, Color Matching Functions, CIE Chromaticity Diagram, Color Monitor Specifications, Out-of-Gamut colors, White point correction, XYZ to RGB transform, Transform with Gamma Correction,  $L^*a^*b^*$  Color model.

Color models in images – RGB color model for CRT displays, Subtractive Color : CMY Color model, Transformation from RGB to CMY, Under color removal : CMYK System, printer Gamuts.

Color models in video – Video Color Transforms, YUV color model, YIQ color model, YCbCr Color Model.

**UNIT 2:**

**VIDEO CONCEPTS:** Types of video signals, Analog video, Digital Video.

**AUDIO CONCEPTS:** Digitization of sound, Quantization and Transmission of audio.

**COMPRESSION ALGORITHMS:**

**LOSSLESS COMPRESSION ALGORITHMS:** Run length coding, Variable length coding, Arithmetic coding, Lossless JPEG, Image Compression.

**LOSSY IMAGE COMPRESSION ALGORITHMS:** Transform Coding:- KLT and DCT Coding, Wavelet based coding.

**IMAGE COMPRESSION STANDARDS:** JPEG and JPEG2000.

**UNIT 3:**

**VIDEO COMPRESSION TECHNIQUES:** Introduction to Video Compression, Video Compression based on Motion Compensation, Search for motion vectors, H.261- Intra-frame and Inter-frame coding, Quantization, Encoder and Decoder, Overview of MPEG1 and MPEG2.

**AUDIO COMPRESSION TECHNIQUES:** ADPCM in Speech Coding, G.726 ADPCM, Vocoders – Phase Insensitivity, Channel Vocoder, Formant Vocoder, Linear Predictive Coding, CELP, Hybrid Excitation Vocoders, MPEG Audio – MPEG Layers, MPEG Audio Strategy, MPEG Audio Compression algorithms, MPEG-2 AAC, MPEG-4 Audio.

**UNIT 4:**

**COMPUTER AND MULTIMEDIA NETWORKS:** Basics of Computer and Multimedia networks, Multiplexing technologies, LAN and WAN, Access networks

**UNIT 5:**

**MULTIMEDIA NETWORK COMMUNICATIONS AND APPLICATIONS:** Quality of Multimedia data transmission, multimedia over IP, Multimedia over ATM networks, Transport of MPEG4, Media on Demand.

**Text books:**

1. Fundamentals of Multimedia – Ze- Nian Li, Mark S. Drew, PHI, 2010.
2. Multimedia Signals & Systems – Mrinal Kr. Mandal ,Springer International Edition 1<sup>st</sup> edition, 2009

**Reference Books:**

1. Multimedia Communication Systems – Techniques, Stds & Netwroks K.R. Rao, Zorans. Bojkorc, Dragorad A.Milovanovic, 1<sup>st</sup> Edition, 2002.
2. Multimedia Systems John F. Koegel Bufond Pearson Education (LPE), 1<sup>st</sup> Edition, 2003.
3. Digital Video Processing – A. Murat Tekalp, PHI, 1996.
4. Video Processing and Communications – Yaowang, Jorn Ostermann, Ya-QinZhang, Pearson,2002

**I Year – II Sem. M.Tech (Wireless & Mobile Communications)**

**VOICE OVER INTERNET PROTOCOL (VoIP)  
(ELECTIVE - IV)**

**UNIT – I:**

**OVERVIEW OF IP PROTOCOL SUITE**

The Internet Protocol, The Transmission Control Protocol(TCP), The User Datagram Protocol (UDP), The Real-time Transport Protocol (RTP), IP multicast, IP version 6 ( IP v6), Interworking IPv4 and IPv6, The VoIP Market, VoIP Challenges.

**UNIT - II:**

**H.323 AND H.245 STANDARDS**

The H.323 Architecture, Call Signaling-Call Scenarios, H.245 Control Signaling Conference calls-The Decomposed Gateway.

**UNIT – III:**

**THE SESSION INITIATION PROTOCOL (SIP)**

SIP architecture- Overview of SIP Messaging Syntax- Examples of SIP Message sequences- Redirect Servers- Proxy Servers. The Session Description Protocol (SDP)- Usage of SDP With SIP.

**UNIT-IV:**

**QUALITY OF SERVICE (QOS)**

Need for QOS – End-to-end QoS, Overview of QOS solutions- The Resource reservation Protocol(RSVP)- Diffserv- The Diffserv Architecture- Multi-protocol Label Switching ( MPLS)- The MPLS Architecture- MPLS Traffic Engineering- Label Distribution Protocols and Constraint- Based Routing.

**UNIT-V:**

**VOIP AND SS7**

The SS7 Protocol Suite- The Message Transfer Part (MTP), ISDN User Part (ISUP) and Signaling Connection Control Part (SCCP), SS7 Network Architecture- Signaling Points( SPs)- Single Transfer Point (STP), - Service Control Point(SCP)- Message Signal Units (MSUs)- SS7 Addressing, ISUP, Performance Requirements for SS7, Sigtran- Sigtran Architecture- SCTP- M3UA Operation- M2UA Operation- M2PA Operation- Interworking SS7 and VoIP Architectures- Interworking Soft switch and SS7- Interworking H.323 and SS7.

**TEXT BOOKS:**

- 1.Carrier Grade Voice over IP – Daniel Collins, 2<sup>nd</sup> ed., TMH.

**I Year – II Sem. M.Tech (Wireless & Mobile Communications)**

**PROPAGATION MODELS FOR WIRELESS COMMUNICATIONS**

**(ELECTIVE - IV)**

**UNIT - I**

**BASIC PROPAGATION MODELS:**

Reflection, refraction and transmission, rough surface scattering, geometrical optics, diffraction. Definition of path loss, noise modeling, free space loss, planet earth loss link budgets.

**UNIT - II**

**MACROCELLS:**

Definition of parameters, empirical path loss models, physical models, ITU-R models, comparison of models.

**SHADOWING:**

Statistical characterization, physical basis for shadowing, impact on coverage, location variability, correlated shadowing.

**FAST FADING:**

Baseband channel representation, AWGN Channel, narrow band fading channel, rayleigh, rice and Nakagami-m distribution, second order fast-fading statistics, autocorrelation function, effect of wideband fading, wide band channel model, wide band channel parameters, frequency domain effects and Bessel functions.

**UNIT - III**

**MICROCELLS:**

Empirical models, physical models, line-of-sight models, non-line-of-sight models.

**PICOCELLS:**

Empirical models of propagation within buildings, physical models of indoor propagation, models of propagation into buildings, shadowing, multipath effects, ultra wide band indoor propagation, and indoor link budgets.

**MEGACELLS:**

Shadowing and fast fading, empirical narrowband models, statistical models, shadowing statistics, physical-statistical models for built-up areas, wide band models, multi-satellite correlations, overall mobile satellite channel model.

**UNIT - IV**

**OVERCOMING NARROWBAND FADING:** Space diversity, polarization diversity, time diversity, frequency diversity and combining methods, macrodiversity, transmit diversity

**OVERCOMING WIDEBAND FADING:** System modeling, linear equalizers, adaptive equalizers, non-linear equalizers, Rake receivers and OFDM receivers.

**UNIT - V**

**CHANNEL MEASUREMENTS FOR MOBILE SYSTEMS:**

Application for channel measurements, Impact of Measurement on accuracies, signal sampling issues, measurement systems equipment calibration and validation outdoor and indoor measurements.

**TEXT BOOKS:**

1. Antennas and propagation for Wireless Communication Systems, Simon R. Saunders, Alejandro Aragon Zavala (2007), 2nd edition, Wiley student Edition, USA.
2. Wireless Communication & Networks, William Stallings (2009), 2nd edition, Pearson Education India, New Delhi.

**REFERENCE BOOKS:**

1. Wireless Communications, Andreas F. Molisch (2011), 2nd Edition, John Wiley and Sons, UK.

**I Year – II Sem. M.Tech (Wireless & Mobile Communications)**  
**SOFTWARE RADIO**  
**(ELECTIVE - IV)**

**UNIT - I**

**INTRODUCTION:**

The need of software radios, what is software radio, characteristics and benefits of software radio, design principles of software radio, RF implementation issues, the purpose of RF front end, dynamic range. The principal challenge of receiver design, RF receiver front end topologies, enhanced flexibility of the RF chain with software radios, importance of the components to overall performance, transmitter architectures and their issues, noise and distortion in the RF chain, ADC and DAC distortion.

**UNIT - II**

**MULTI RATE SIGNAL PROCESSING:**

Introduction, sample rate conversion principles, polyphase filters, digital filter banks, timing recovery in digital receivers using machine digital filters.

**DIGITAL GENERATION SIGNALS:**

Introduction, comparison of direct digital synthesis with analog signal synthesis approaches to direct digital synthesis, analysis of spurious signals, spurious components due to periodic jitter, band pass signals generation, performance of direct digital synthesis, hybrid DSS PLL systems, applications of direct digital synthesis, generation of random sequences, ROM compression technologies, sine phase difference algorithm approach, modified sine phase difference approach.

**UNIT - III**

**ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERSION:**

Parameters of ideal data converters, parameters of practical data converters, analog to digital and digital to analog conversion techniques to improve data converter performance, common ADC and DAC architectures.

**DIGITAL HARDWARE CHOICES:** Introduction, key hardware elements, DSP processors, field programmable gate arrays, tradeoffs in using DSPs, FPGAs and ASICs power management issues using communication of DSP, FPGAs and ASICs.

**UNIT - IV**

**SMART ANTENNAS:** Vector channel modeling, benefits of smart antennas- structures of beam forming systems, smart antenna, algorithms, diversity and space time adaptive signals processing, algorithms for transmit STAP, hardware implementation of smart antennas, array calibration.

**UNIT - V**

**OBJECT ORIENTED REPRESENTATION OF RADIOS AND NETWORK RESOURCES:**

Networks, object oriented programming, object brokers, mobile applications environments, joint tactical radio systems.

**CASE STUDIES IN SOFTWARE RADIO DESIGN:** Introduction and historical perspective SPEAK easy, JTRS, JTRs wireless information transfer system, SDR-3000 digital transceiver subsystem, spectrum ware, CHARIOT.

**TEXT BOOKS:**

1. Software Radio: A modern Approach to Radio Engineering, Jeffrey H. Redd (2002), Pearson Education Asia, New Delhi, India.
2. Software Define Radio Fabrication Technologies, Walter Tuttle Bee (2002), Wiley publications, New Delhi, India.

G.Narayanamma Institute of Technology & Science (for women)  
(Autonomous)

(With Effect from 2012-13)

M.Tech(Wireless & Mobile Communications)

**REFERENCE BOOKS:**

1. Software Defined Radio for 3G, Paul Burns (2002), Arech House, Norwood, MA, United States.
2. Software Defined Radio: Architectures, Systems and Functions Markus Dilinger, Kambiz Madani, Nancy Alonistioti (2002), John Wiley and Sons, New Delhi, India.
- 3 Software Radio Architecture: Object Oriented Approaches to Wireless of System Engineering,. Josephal Itola III (2000), John Wiley & sons, New Delhi.
4. R.F. Mocroelectronics, B.Razavi (1998), , Prentice Hall of India.
5. DSP – A Computer based Approach, S. K. Mithra (1998), Tata McGraw Hill, New Delhi, India.

**ADVANCED COMMUNICATIONS & COMPUTER NETWORKS LAB**

**Note:**

- A. Minimum of 10 Experiments have to be conducted
- B. All Experiments may be Simulated using MATLAB/NETSIM/NS2 and to be verified using related training kits.

1. Verification of minimum distance in Hamming code.
2. Determination of output of convolution encoder for a given sequence
3. Determination of output of convolution decoder for a given sequence
4. Observing the wave forms at various test points of a mobile phone using mobile phone trainer.
5. Study of direct sequence spread spectrum modulation & demodulation using CDMA-DSSS-BER trainer.
6. Determination of Losses in Optical Fiber
7. Characteristics of Light Emitting Diode
8. Routing Information Protocol (RIP): A Routing Protocol based on the distance vector Algorithm
9. OSPF: Open Shortest Path First: A Routing Protocol based on the Link State Algorithm
10. Transmission Control Protocol (TCP): A Reliable connection oriented byte stream service Queuing disciplines
11. Applications : Network Applications, Performance and Analysis
12. Wireless Local Area Networks : Medium Access control for wireless connected stations
13. Mobile Wireless Networks : A wireless Local Area Network with mobile stations