ACADEMIC REGULATIONS, COURSE STRUCTURE
AND DETAILED SYLLABUS

M.Tech (WIRELESS AND MOBILE COMMUNICATIONS)

FOR
MASTER OF TECHNOLOGY TWO YEAR POST GRADUATE COURSE
(Applicable for the batches admitted from 2014-2015)

R14

ANURAG
Engineering Engineers

ANURAG GROUP OF INSTITUTIONS
(AUTONOMOUS)
SCHOOL OF ENGINEERING
Venkatapur, Ghatkesar, Hyderabad – 500088
## ANURAG GROUP OF INSTITUTIONS
(AUTONOMOUS)

M.Tech. (WIRELESS AND MOBILE COMMUNICATIONS)

COURSE STRUCTURE AND SYLLABUS

### 1 Year I Semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>L</th>
<th>P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>A31080</td>
<td>Advanced Data Communications</td>
<td>3</td>
<td>0</td>
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<tr>
<td>A31081</td>
<td>TCP/IP and ATM Networks</td>
<td>3</td>
<td>0</td>
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<td>A31082</td>
<td>Advanced Digital Signal Processing</td>
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<tr>
<td>A31083</td>
<td>Image and Video Processing</td>
<td>3</td>
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<tr>
<td></td>
<td>Elective -I</td>
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<tr>
<td>A31084</td>
<td>Detection and Estimation Theory</td>
<td></td>
<td></td>
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<tr>
<td>A31085</td>
<td>Random Processes and Time Series Analysis</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>A31086</td>
<td>RF Circuit Design</td>
<td></td>
<td></td>
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<tr>
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<td>Elective -II</td>
<td>3</td>
<td>0</td>
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<tr>
<td>A31087</td>
<td>Voice Over IP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A31088</td>
<td>Satellite Communications</td>
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<tr>
<td>A31089</td>
<td>Spread Spectrum Communications</td>
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<td>A31221</td>
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<tr>
<td>A31222</td>
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### 1 Year - II Semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
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<tbody>
<tr>
<td>A32086</td>
<td>Coding Theory and Techniques</td>
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<tr>
<td>A32072</td>
<td>Wireless Communications &amp; Networks</td>
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<td>A32087</td>
<td>Optical Communications Technology</td>
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<td>Optical Networks</td>
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<td>Mobile Computing Technologies</td>
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<td>A32091</td>
<td>Ad-hoc and Wireless Sensor Networks</td>
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<td>A32073</td>
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<td>A32092</td>
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<td>A32093</td>
<td>Propagation Models for Wireless Communications</td>
<td></td>
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<td></td>
<td>Software Radio</td>
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<td>A32221</td>
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<td>A32222</td>
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### II Year - I Semester

<table>
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<tr>
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<td>-</td>
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<tr>
<td>A33232</td>
<td>Project Seminar</td>
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<tr>
<td>A33233</td>
<td>Project work</td>
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<td></td>
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### II Year - II Semester

<table>
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<th>P</th>
<th>Credits</th>
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<tbody>
<tr>
<td>A34211</td>
<td>Project work and Seminar</td>
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<tr>
<td></td>
<td>Total Credits</td>
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<td>-</td>
<td>22</td>
</tr>
</tbody>
</table>
Academic Regulations for M. Tech (Regular) Degree Course
(Effective for the students admitted into 1 year from the Academic Year 2014-2015 onwards)

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.

1.0 ELIGIBILITY FOR ADMISSIONS:
Admission to the above program shall be made subject to 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 qualifying candidate at an Entrance Test conducted by the University or on the basis of any other order of merit approved by the University, subject 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 he pursues a course of study and completes it successfully for not less than two academic years 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 minimum instruction period for each semester is 90 clear instruction days.

3.0 COURSE OF STUDY
The following specializations are offered at present for the M.Tech Course of study.

1. CAD / CAM
2. Computer Science
3. Computer Science and Engineering
4. Electrical Power systems
5. Electronics and Communication Engineering
6. Embedded Systems
7. Machine Design
8. Power Electronics and Electrical Drives
9. Software Engineering
10. Structural Engineering
11. VLSI System Design
12. Wireless and Mobile Communications
13. Computer Networks and Information Security
14. Construction Management
4.0 ATTENDANCE:

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

4.1 A candidate shall be deemed to have eligibility to write end semester examinations in a subject if he has put in at least 75% of attendance in the subject.

4.2 Shortage of attendance up to 10% in any subject (i.e. 65% and above and below 75%) may be condoned by the college Academic council on genuine and valid reasons on representation by the candidate with supporting evidence.

4.3 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, as per the course structure.

4.4 Shortage of attendance below 65% shall in no case be condoned

4.5 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 practical's, on the basis of internal evaluation and End semester Examination.

For the theory subjects 60 marks shall be awarded based on the performance in the End semester Examination, 30 marks shall be awarded based on the internal evaluation and 10 marks for assignment.

5.1 For theory subjects, during the semester there shall be 2 midterm examinations. Each midterm examination consists of one subjective paper and one assignment. The subjective paper is for 30 marks with duration of 2 hours. Subjective paper of each semester shall contain 2 parts Section-A & Section-B. Section-A comprises of five (5) short answer type of questions. The student has to answer all the questions from section-A. Each question carries two marks. A total of ten marks are allocated to section-A. Section-B consists of five (5) essay type of questions from which the student has to answer three questions. Each question carry not more than seven (7) marks. A total of 20 marks are allocated for section-B. The questions in the first midterm examination includes the topics of first 2.5 units while the questions in the second midterm examination includes the topics of remaining 2.5 units. The assignments should be submitted before the conduct of respective midterm examinations.

The total marks secured by the student are out of 40 marks (30marks from midterm examination and 10 marks from assignment) in an internal examination for a subject. The average of marks secured in two midterm examinations shall be taken as final marks. If he/she is absent for any test / assignment, he/she are awarded zero marks for that test / assignment.

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 and II Semester. 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 from and shall make an oral 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 he/she studies during the M.Tech course of study. The Comprehensive viva-voce 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 he secures a minimum of 40% of marks in the End Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

5.6 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 4.3) he has to reappear for the End Examination in that subject. 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 he has failed in the end examination. In such case candidate must re-register 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 upon the eligibility for writing the end examination in those subject(s). 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), he shall not be permitted to appear for the End Examination in that subject(s). 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 Laboratory Class Teacher and second examiner shall be other Laboratory Teacher.

6.0 EVALUATION OF PROJECT/DISSERTATION WORK:

Every candidate shall be required to submit thesis or dissertation after taking up a topic approved by the project review committee.

6.1 A Project Review Committee (PRC) shall be constituted with Principal as chair person, Heads of all the departments which are 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 (theory and practical subjects).

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
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 his supervisor or topic of the project he can do so with the approval of Departmental Committee. However, the Departmental Committee shall examine whether the change of topic/supervisor leads to a major change of his initial plans of project proposal. If so, 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 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 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 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 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 Institution. For this, Chairmen, BOS of the respective departments shall submit a panel of 5 examiners, who are eminent in that field with the help of the concerned guide and senior faculty of the department.

6.9 If the report of the examiner is not favourable, the candidate shall revise and resubmit the thesis, in the time frame as prescribed by PRC. If the report of the examiner is unfavourable again the thesis shall be summarily rejected.

6.10 If the report of the examiner is favourable, 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 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

After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of M.Tech Degree, he shall be placed in one of the following four classes.

<table>
<thead>
<tr>
<th>Classes Awarded</th>
<th>% of marks to be secured</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class with Distinction</td>
<td>70% and above</td>
</tr>
<tr>
<td>First Class</td>
<td>Below 70% but not less than 60%</td>
</tr>
<tr>
<td>Second Class</td>
<td>Below 60% but not less than 50%</td>
</tr>
</tbody>
</table>

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

8.0 WITH-HOLDING OF RESULTS:

If the candidate has not paid any dues to the institution or if any case of in-discipline is pending against him, the result of the candidate will be withheld and he will not be allowed into next higher semester. The issue of the degree is liable to be withheld in such cases.

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 the Academic Council is final.
10.3 The institution 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 institution.
10.4 Wherever the word he, him or his occur, it will also include she, her and hers. There shall be no transfers within the constituent colleges of Jawaharlal Nehru Technological University.
# Malpractices Rules

## Disciplinary Action for Improper Conduct in Examinations

<table>
<thead>
<tr>
<th>Nature of Malpractices/Improper conduct</th>
<th>Punishment</th>
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</thead>
<tbody>
<tr>
<td>If the candidate:</td>
<td></td>
</tr>
<tr>
<td>1. (a) Possesses of 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)</td>
<td>Expulsion from the examination hall and cancellation of the performance in that subject only</td>
</tr>
<tr>
<td>(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.</td>
<td>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.</td>
</tr>
<tr>
<td>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.</td>
<td>Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidates 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 controller of examinations, AGI.</td>
</tr>
<tr>
<td>3. Impersonates any other candidate in connection with the examination.</td>
<td>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 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 semester 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.</td>
</tr>
<tr>
<td>4. Smuggles in the Answer book or</td>
<td>Expulsion from the examination hall and</td>
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<tr>
<td>5.</td>
<td>5. 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.</td>
</tr>
<tr>
<td>6.</td>
<td>6. Refuses to obey the orders of the Chief Superintendent/Assistant-Supervisor/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 person or to any office 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 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. In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subjects 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.</td>
</tr>
<tr>
<td>7.</td>
<td>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 candidates 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 semester examinations. The continuation of the course by the candidate is subject to the academic regulation in connection with forfeiture of seat.</td>
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<tr>
<td>8.</td>
<td>Posses any lethal weapon or firearm in the examination hall.</td>
</tr>
<tr>
<td>9.</td>
<td>If student of the college, who is not a candidate for the particular examination or any person not connected with college indulges in any malpractice or improper conduct mentioned in clause 6 to 8</td>
</tr>
<tr>
<td>10.</td>
<td>Comes in a drunken condition to the examination hall.</td>
</tr>
<tr>
<td>11.</td>
<td>Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.</td>
</tr>
<tr>
<td>12.</td>
<td>If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Malpractices committee, AGI for further action to award suitable punishment.</td>
</tr>
</tbody>
</table>
UNIT -I:
Digital Modulation Schemes: BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:

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

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:

REFERENCE BOOKS:
1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
TCP/IP AND ATM NETWORKS

UNIT -I:
Internet Protocol: Internetworking, IPv4, IPv6, Transition from IPv4 to IPv6, Process to process delivery, UDP, TCP and SCTP.

UNIT -II:
Congestion Control and Quality of Service: Data traffic, congestion, congestion control, two examples, Quality of Service, Techniques to improve QoS, Integrated services, and Differentiated services.

UNIT -III:

UNIT -IV:
X.25: X.25 layers, X.21 protocol,

UNIT -V:
Interconnection Networks: Introduction, Banyan Networks, Properties, Crossbar Switch, Three Stage Class Networks, Rearrangeble Networks, Folding Algorithm, Benes Networks, Lopping Algorithm, Bit Allocation Algorithm.

TEXT BOOKS:
1. Data communication and Networking - B.A. Forouzen, 4th Edition TMH

REFERENCE BOOKS:
2. Wireless Digital Communications - Kamilo Fehri - 1999 PHI
ADVANCED DIGITAL SIGNAL PROCESSING

UNIT -I:
**Review of DFT, FFT, IIR Filters and FIR Filters:**
Multi Rate 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.

UNIT -II:
**Applications of Multi Rate Signal Processing:** Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Subband Coding of Speech Signals, Quadrature Mirror Filters, Transmultiplexers, Over Sampling A/D and D/A Conversion.

UNIT -III:
**Non-Parametric Methods of Power Spectral Estimation:** from spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT -IV:
**Implementation of Digital Filters:** Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT -V:

**TEXT BOOKS:**

**REFERENCE BOOKS:**
UNIT I:
Image Segmentation: Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region based segmentation.

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

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

UNIT IV:

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, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

REFERENCE BOOKS:
DETECTION AND ESTIMATION THEORY
(ELECTIVE - I)

UNIT -I:

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 Estimators, Nonlinear Minimum Mean Squared Error Estimators, Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT -IV:

UNIT -V:

TEXT BOOKS:

REFERENCE BOOKS:
3. Introduction to Statistical Signal Processing with Applications - Srinath, Rajasekaran, Viswanathan, 2003, PHI.
M.Tech. - WIRELESS AND MOBILE COMMUNICATIONS-R13 Regulations

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RANDOM PROCESSES AND TIME SERIES ANALYSIS
(ELECTIVE - I)

UNIT I:

UNIT II:
Some special cases: The Poisson process, the Normal (Gaussian) Process.

UNIT III:
Linear Systems with random input: Impulse response, Transfer function, the relation between the spectral density for the input and for the output

UNIT IV:
Markov Chains: Markov Processes: Discrete time Markov chains, state transition probability matrix, n-step state transition probability, transition diagrams, classification of states, limiting state probabilities, Continuous-time Markov chains, Gambler’s ruin as a Markov chains

UNIT V:
Basic Queueing Theory: Elements of a Queueing System, Little’s Formula, M/M/1, Queue- Delay Distribution in M/M/1 System, M/M/1 System with Finite Capacity, M/G/1 Queueing system- Residual Service Time, Mean Delay in M/G/1 Systems.

TEXT BOOKS:

REFERENCE BOOKS:
RF CIRCUIT DESIGN
(ELECTIVE - I)

UNIT - I:

UNIT - II:
Single And Multiport 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.

UNIT - IV:

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:

REFERENCE BOOKS:
1. Radio frequency and microwave electronics illustrated Mathew M.Radmangh, 2001, PE Asia Publication.
UNIT -I:

UNIT -II:

UNIT -III:

UNIT -IV:

UNIT -V:

TEXT BOOK:
Carrier Grade Voice over IP -- Daniel Collins, 2nd ed., TMH.

REFERENCE BOOKS:
M.Tech. - WIRELESS AND MOBILE COMMUNICATIONS-R13 Regulations
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech – I Year – I Sem. (WMO)

SATELLITE COMMUNICATIONS
(ELECTIVE - II)

UNIT I:

UNIT II:
Satellite Sub-Systems: Altitude 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), Link Budget.

UNIT III:
Propagation Effects: Introduction, Atmospheric Absorption, Cloud Attenuation, Tropospheric and Ionospheric Synchronization and Low angle fading, Rain induced attenuation, rain induced cross polarization interference.

UNIT IV:
Earth Station Technology: Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Power Test Methods, Lower Orbit Considerations.

UNIT V:

TEXT BOOKS:

REFERENCE BOOKS:
SPREAD SPECTRUM COMMUNICATIONS
(ELECTIVE - IV)

UNIT I:

UNIT II:

UNIT III:
Initial Synchronization of the Receiver Spreading Code: Introduction, Problem Definition and the Optimum Synchronizer, Serial Search Synchronization Techniques, Synchronization using a Matched Filter, Synchronization by Estimated the Received Spreading Code.

UNIT IV:

UNIT V:

TEXT BOOKS:

REFERENCE BOOKS:
M.Tech. - WIRELESS AND MOBILE COMMUNICATIONS-R13 Regulations

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COMMUNICATION LAB - I

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. Implementation of Matched Filters.
2. Optimum receiver for the AWGN channel.
5. Generation of constant envelope PSK signal wave form for different values of M
6. Simulation of PSK system with M=4
7. Simulation of DPSK system with M=4
8. Design of FSK system
9. Simulation of correlation type demodulation for FSK signal
10. BPSK Modulation and Demodulation techniques
11. QPSK Modulation and Demodulation techniques
12. DGPSK Modulation and Demodulation techniques
13. 8-QAM Modulation and Demodulation techniques
14. DQAM Modulation and Demodulation techniques
15. Verification of Decimation and Interpolation of a given signal
16. Power spectrum estimation using AR models
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:
Hall, Inc.

REFERENCE BOOKS:
1. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Introduction to Error Control Codes-Salvatore Gravano-Oxford
4. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, 2006,
Wiley india.
UNIT I:

UNIT II:

UNIT III:
Mobile Radio Propagation: Small-Scale Fading and Multipath: Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT IV:

UNIT V:
Wireless Networks: Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11,IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.

TEXT BOOKS:

REFERENCE BOOKS:
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
UNIT -I:

UNIT -II:

UNIT -III:

UNIT -IV:

UNIT -V:

TEXT BOOKS:

REFERENCE BOOKS:
TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS

UNIT I:

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, Signalling Techniques, In-channel Signalling, Common Channel Signalling, Cellular Mobile Telephony

UNIT IV:
Packet Switching: Statistical Multiplexing, Local- Area and Wide- Area Networks, Large-scale Networks, Broadband Networks.
Switching Networks: Single- Stage Networks, Gradings, 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:

TEXT BOOKS:
1. Telecommunication Switching Systems and Networks- Thilagarajan Viewanathan, 2000, PHI.

REFERENCE BOOKS:
2. Data Communications and Networks- Achyut S. Godbole, 2004, TMH.
OPTICAL NETWORKS
(ELECTIVE – III)

UNIT – I:

UNIT – II:

UNIT – III:

UNIT – IV:

UNIT – V:

TEXT BOOKS:

REFERENCE BOOKS:
MOBILE COMPUTING TECHNOLOGIES
(ELECTIVE - III)

UNIT - I:

UNIT - II:

UNIT - III:
Intelligent Networks and Interworking: Introduction – Fundamentals of Call processing – Intelligence in the Networks – SS7 Signaling – IN Conceptual Model (ICM) – soft switch – Programmable Networks – Technologies and Interfaces for IN

UNIT - IV:

UNIT - V:

TEXT BOOKS:

REFERENCE BOOKS:
1. The CDMA 2000 System for Mobile Communications – Vieri Vaugh, Alexander Damn
JaewonC – Pearson
UNIT-I:
Wireless Internet:
Wireless Internet, Mobile IP, TCP in Wireless Domain, WAP, Optimizing Web Over Wireless.

UNIT-II:

UNIT-III:

UNIT -IV:

UNIT -V:

TEXT BOOKS:

REFERENCE BOOKS:
UNIT -I:
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.

UNIT -II:
Conventional Encryption: Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

UNIT -III:
Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT -IV:
Hash and Mac Algorithms: MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC.

UNIT -V:
Intruders, Viruses and Worms: Intruders, Viruses and Related threats.
Fire Wall: Fire wall Design Principles, Trusted systems.

TEXT BOOK:

REFERENCE BOOK:
Principles of Network and Systems Administration, Mark Burgess, John Wiely
M.Tech. - WIRELESS AND MOBILE COMMUNICATIONS-R13 Regulations
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech - I Year - II Sem. (WMC)

PROPAGATION MODELS FOR WIRELESS COMMUNICATION
(ELECTIVE - IV)

UNIT I:

UNIT II:

UNIT III:
Mega Cells: Shadowing and Fast fading, Empirical Narrowband models, Statistical Models, Physical-Statistical models for built-up areas, and over all mobile satellite channel model.
Shadowing: Statistical characterization, Physical basis for shadowing, Impact on coverage, location variability, correlated shadowing.

UNIT IV:
Fast Fading: Narrow band fast fading channel, AWGN Channel, Narrow band fading channel, Rayleigh, Rice and Nakagami-m distribution, Wideband fast fading - Effect of wideband fading, wide band channel model and parameters, frequency domain effects and Bell functions.
Overcoming Narrowband Fading: Space diversity, Polarization diversity, Time diversity, frequency diversity, and combining methods
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 in accuracies, Signal sampling issues, measurement systems, equipment calibration and validation, outdoor and indoor measurements.

TEXT BOOKS:

REFERENCE BOOKS:
SOFTWARE RADIO
(ELECTIVE – IV)

UNIT I:

UNIT II:

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.

UNIT IV:
Digital Hardware Choices: Introduction- Key Hardware Elements- DSP Processors- Field Programmable Gate Arrays- Trade-Offs in Using DSPs, FPGAs, and ASICs- Power Management Issues- Using a Combination of DSPs, FPGAs, and ASICs.

UNIT V:

TEXTBOOKS:

REFERENCE BOOKS:
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. Measurement of Bit Error Rate using Binary Data
2. Verification of minimum distance in Hamming code
3. Determination of output of Convolutional Encoder for a given sequence
4. Determination of output of Convolutional Decoder for a given sequence
5. Efficiency of DS Spread- Spectrum Technique
6. Simulation of Frequency Hopping (FH) system
7. Determination of Losses in Optical fiber
8. Calculation of Numerical Aperture in Optical fibers
9. Observing the waveforms at various test points of a mobile phone using Mobile Phone Trainer
10. Study of direct sequence spread spectrum modulation and demodulation using CDMA-DSSS-BER trainer
11. Study of ISDN training system with protocol analyzer
12. Characteristics of LASER diode
13. Determination of parameters using global positioning system trainer