

Proposed Scheme for M.E. (Electronics & Telecommunication Engineering)
Four Semester Course
Scheme for Instruction and Examination
 (Revised for academic year 2003-2004)

| Sr. No. | Subject Title | 1 hour periods/week | | Duration of Paper | Marks | |
|----------------------------|--------------------------------------|---------------------|-------------------|-------------------|--------------|---------------------|
| | | Lecture | Practical/Seminar | | Theory Paper | Internal Assessment |
| <u>SEMISTER I</u> | | | | | | |
| 01 | Statistical Theory of Communication | 3 | 2 | 3hrs | 100 | 50 |
| 02 | Communication Networks | 3 | 2 | 3hrs | 100 | 50 |
| 03 | Microwave Integrated Circuits | 3 | 2 | 3hrs | 100 | 50 |
| 04 | Error Correcting Codes | 3 | 2 | 3hrs | 100 | 50 |
| 05 | Elective I | 3 | 2 | 3hrs | 100 | 50 |
| TOTAL | | 15 | 10 | | 500 | 250 |
| <u>SEMISTER II</u> | | | | | | |
| 01 | Microwave Devices & amplifier design | 3 | 2 | 3hrs | 100 | 50 |
| 02 | Satellite Communication System | 3 | 2 | 3hrs | 100 | 50 |
| 03 | Advanced Digital Communication | 3 | 2 | 3hrs | 100 | 50 |
| 04 | Mobile Communication Systems | 3 | 2 | 3hrs | 100 | 50 |
| 05 | Elective II | 3 | 2 | 3hrs | 100 | 50 |
| TOTAL | | 15 | 10 | | 500 | 250 |
| <u>SEMISTER III</u> | | | | | | |
| 01 | Seminar on Special topics | | | | | 50 |
| 02 | Dissertation Seminar | | | | | 50 |
| TOTAL | | | | | | 100 |
| <u>SEMISTER IV</u> | | | | | | |
| 01 | Pre-synopsis Dissertation Seminar | | | | | 50 |
| 02 | Dissertation & Viva Voce | | | | 100 | 100 |
| TOTAL | | | | | 100 | 100 |
| GRAND TOTAL | | | | | 1100 | 750 |

Elective I

- i) Fibre Optic Communication
- ii) Antenna Theory and design

Elective II

- i) Advanced Digital Signal Processing
- ii) Data Compression Methods
- iii) Simulation of communication systems

- Seminar on Special Topics – Each candidate should be assigned the seminar topic right in the beginning of the semester, and the student has to do exhaustive literature survey, case studies etc. which has to be presented at the end of the semester. The student has to be in seminar in front of the committee consisting of the faculty member of the department and has to be evaluated by the committee combinedly.
- # 1. During III & IV semesters, the student should work full time his/her semester and dissertation work.
2. Student teacher contact hours for dissertation and seminar during III & IV semester will be 2 hrs. / teacher/week.

SEM II

MICROWAVE DEVICES AND AMPLIFIER DESIGN

1. **Avalanche Devices and Circuits:**
IMPATT diode operation, Read Diode large signal analysis, of the Read diode, Temperature effects, spurious oscillation, IMPATT noise efficiency, TRAPATT mode.
2. **Gunn Effect Devices:**
Ridley-Watkins – Hilsun mechanism, domain formation, operating modes, larges, large signal dipole domain analysis, current – field characteristic, noise in Gunn device.
3. **Representation Of Two-Port Networks:**
Introduction, impedance, admittance, hybrid and ABCD matrices, traveling waves and transmission line concepts. Scattering matrix and the chain scattering matrix, shifting reference plans, properties of scattering parameters, generalized scattering parameters two-port network parameters conversions, scattering parameters of transistors, characteristic of microstrip transistors.
4. **Mathing Networks And Signal Flow Graphs:**
Introduction, Smith chart, normalized impedance and admittance smith chart impedance matching networks, micro strip matching networks, signal flow graph, application of signal flow graphs.
5. **Microwave Transistor Amplifier Design:**
Introduction, powers gain equations, Stability consideration, constant gain circles unilateral case, and unilateral figure of merit, simultaneous conjugate match bilateral case, constant gain circles-bilateral case, operating and available power gain circles DC bias networks.
6. **Noise Broadband and High Power Design Methods:**
Introduction, noise in tow port networks, constant noise figure circles, broadband amplifier design, amplifier tuning Bandwidth analyses, high power amplifier design two stage amplifier design.
7. **Microwave Transistor Oscillator Design:**
Introduction, one part negative – resistance oscillators, two part negative resistance oscillator, oscillator design using large signal measurements, oscillator configurations.
8. **S-Parameters and Noise Measurement:**
Network analysis and be automatic measurement of scattering parameters transfer noise factor, measurement, and characterization of the spectral purity of -----?

Text and Reference Books:

1. Microwave Transistor Amplifiers – Analysis And Design – Couillermo Copenzy (text)
2. Microwave Amplifiers And Oscillators – Christian Ceentili (Test)
3. Microwave semiconductor Circuit Design – W. Alaq Daris – Van Nostrand

SATELLITE COMMUNICATION SYSTEM

1. **Introduction:** Origin of satellite communication, Development, Space segment Ground segment, Types of orbit, Evolution of satellite communications, Development of service.
2. **Link Analysis:** Characteristic parameters of an antenna, Received signal power at receiver input, Carrier to noise ratio at the receiving input, Influence of the propagation medium, Compensation for the effects of the propagation medium constraints, Signal to noise ratio for a station-to-station link.
3. **Regenerative Satellite Networks:** Transparent and regenerative repeaters, Comparison of link budgets on board processing, Impact to the earth segment.
4. **Orbits:** Keplerian orbits
Useful orbits for satellite communication.
Perturbations of the orbits.
5. **Earth Stations :** Station organization, Radio frequency characteristics, Antenna subsystems, Radio frequency subsystem, Communication subsystem.
6. **Communication Payload :** Mission and characteristics of the payload, Transparent repeaters, Multibeam satellite repeaters, Regenerative – repeater , Antenna coverage, Antenna Characteristics.
7. **Platform :** Subsystems, Attitude control, Propulsion subsystem, Electric power supply, Telemetry, tracking and command, Thermal control and structure.
8. **Satellite Installation And Space Environment :** Installation in orbit, Vacuum, Mechanical environment, Radiation flux of high energy particles, Environment during installation.
9. **Satellite Installation And Space Environment :** Satellite system availability. Component reliability.
10. **Multiple Access:** Principle of multiple access Time division multiple access, Code division multiple access Fixed and on demand assignment, Random access.

11. Introduction To Vast Networks

Text And Reference Books:

1. Satellite Communication Systems Techniques and Technology (3rd edition, Maral and M. Bousquet. John Wiley and sons (Text)
2. VASAT Networks G. Maral, John Wiley and sons (Text)
3. Satellite Communication. First quarter century of service David W.E. Rees John Wiley and Sons (Ref)
4. Satellite Communications Systems Design principles – Richard M. McGraw Hill (Ref)
5. CDMA, Principles of Spread Spectrum Communication – Andrew J Virebi, Addison – Wesley 1995 (Ref).

ADVANCE DIGITAL PROCESSING

1. **Design of Digital filter** : Design of fire filter, symmetric and anti symmetric, linear phase, optimum, equiripple, FIR Differentiators, Helbert – transformers, design of IIR filter – Impulse invariance bilinear transformation, matched transformation, frequency transformation, in along and gidgital domain, design of digital filters based on least square method.
2. **Multirate Digital Signals Processing** : Decimation by a factor D, Interpolation, filter design and implementation, sampling rate conversion, applications of multirate signal processing.
3. **Power Spectral Estimation** : Parametric and non-parametric method for power spectral estimation, minimum variance.
4. **Effect of finite resister length** : Effect on quantization, realization of FIR & IIR filters and Fourier transfor computation adaptive digital filters, its applications, application of DSP to speech processing.
5. **Radar Signal Processing**
6. **Application of DSP to speech Processing.**

Text and Reference Books:

1. **Digital Signal Processing – John G. Proakis, Prentice Hall**
2. **Digital Signal Processing – A.V. Oppenheim & R.W. Schafer, Prentice Hall**
3. **Theory and application of digital signal processing – L.R.Rainer and B. Gold.**

MOBILE COMMUNICATIONS SYSTEMS

1. Digital Cellular Mobile Systems :- GSM, IS – 136, PDC, IS – 95
2. Low Power wireless communication systems : CT2, DECT
3. IMT – 2000, Third Generation Mobile Communication systems:- Introduction, IMT – 2000 radio aspects, IMT – 2000 network aspects, Summary regional initiatives on IMT – 2000.
4. Universal Personal Telecommunication:- UPT concepts and service aspects, Functional architecture for UPT, Numbering, Routing and Billing aspects, Scenarios for partitioning and location of service profile information, Access Security requirements for UPT, UMTS.
5. Private Mobile Radio Environment :- Introduction, PMR user community, Requirements of PMR services, PMR configurations PMR standards.
6. Intelligent Cell Concept and Applications
7. An Overview of TETRA System :- Basic Services, Network architecture, Circuit mode logical channel hierarchy, mapping of logical channels Operation of TETRA . '+D mode, Special features of V+D mode, Voice coding TETRA,, Data services in V+D mode, Direct mode.
8. TETRA System Architecture, Components and Services:- Introduction, TETRA user groups, System architecture and components, system interfaces, TETRA reference, configuration, Subscriber Access interface, Peripheral equipment interface, Addressing and identities, TETRA network services, TETRA inter-system interfaces, TETRA comparison with GSM.
9. TETRA Network Layer Protocol:- Introduction, Concept, Overview, Mobile to base link entity, Circuit mode connect entity.
10. Operational Aspects of TETRA Network:- Introduction, Network security management, TETRA inter-system signaling, TETRA network management.

Reference Books:

1. Digital Mobile Communication and TETRA Systems
John Dunlop, Demessie Girma, Jamey Irvine, John Wiley &
2. Mobile & Personal Communication Systems and Services
Rai Pandya, Prentice Hal of India Pvt Ltd.
3. Mobile Cellular Telecommunications
William C.Y. Lee, McGraw Hill, Inc.
4. Universal Mobile Telecommunication System
TMH, edited by

ADVANCED DIGITAL COMMUNICATION

1. **Source Coding:** Average mutual information and entropy – coding for discrete sources – the Lempel – Ziv algorithm – Coding for analog sources – Temporal waveform coding – special waveform coding – Model – based source coding.
2. **Digital Modulation – demodulation techniques:**
Review of various RSK, PSK and QAM techniques, linear modulated Signal. Non-linear modulation methods with memory CPM, CPFSK, MSK-Power Spectra, Optimum receiver for CPM Signals.
3. **Signal design for Band limited Channels:** Nyquist – Criterion for Zero – ISI – Design of band limited signals with controlled ISI – data detection for control ISI.
4. **Optimum receiver for channels with ISI of AWGN:** Optimum maximum likelihood receiver – Linear equalization – decision feedback equalization – Adaptive equalization.
5. **Spread spectrum signals for digital communication:** Direct sequence frequency – hop spread spectrum signals- performance and applications – generation of PN sequences – Synchronization of Spread Spectrum Signals.

Text and Reference Book:

1. Digital Communication by John G Proakis McGrill Hill
2. Digital communication techniques by Simon, Lindsey, PHI
3. Advanced Digital Communications systems & Signals processing techniques by Dr. Kamilo Feher Poentia Hall.

DATA COMPRESSION METHODS

1. **Introduction :** Compression Techniques, Loss less and loss Compression, Modeling, Coding Measures of performance of compression techniques.
2. **Mathematical background:** Introduction to information theory, Conditional Energy, Differential Energy, Modeling, Physical Statistical, Models, Random Variables, Distribution Functions, Stochastic Process, Matrix Operations.
3. **Huffman Coding:** Huffman Coding Algorithm, Minimum variance codes, extended Huffman codes, Non – binary Huffman codes, Adaptive Huffman coding, Updating procedure.
Encoding / Decoding Application of Huffman Coding to Image, Text and Audio compression.
4. **Arithmetic Coding:** Coding a sequence Tag, Generating Binary Code, Comparison of Huffman and Arithmetic Coding, Application of Arithmetic Coding to Image.
5. **Dictionary Based Compression:** State Dictionary, Adaptive dictionary, L777 and 778 algorithms. Application of dictionary Techniques of file and image compression, V42 bis standard
6. **Lossless Image Compression:** Run Length coding, Facsimile coding Standards, Progressive Image Transmission, and Image Compression. Model: Linear prediction Model, Context Model, Multi quantizers, Structured quantizers.
7. **Quantization:** Scalar Quantization: Uniform Quantization, vector Quantization Linde-buzo-Gray Algorithm. Tree – structured quantizers, Structured quantizers.
8. **Coding: Differential Coding;**
9. **Analysis/Synthesis:**
Speech Coding:
Channel Vocoder, Linear Predictive Coder, Code Excited Linear Prediction Sinusoidal Coder, Fractal Image compression.
- 10 **Video Compression:** Motion Compensation, Algorithm for Video Conferencing MPEG Video Standards, packet Video.

Text and Reference Books:

1. Introduction to Data Compression Book-Khalid Sayood, Morgan Huffman Publishers.
2. The Data Compression book-Mark Nelson, BPB Publication (Undo arrangement with M & T publishing Inc.)
3. Data Compression: The Complete Reference Davids. Spring Verion new yark incor

SIMULATION OF COMMUNICATION SYSTEMS

1. **Review Topics :** Modelling and simulation of continuous linear and non-linear systems. Random variables, stochastic processes and probability concepts in simulation. Monte carlo simulation, generation of random numbers.
2. Discrete event system simulation, simulation of single server Queuing system, models of arrival processes, Input modeling, selecting of output data, Estimation and analysis of result, verification and validation of simulation models.
3. **Simulation languages :** GPSS, SIMSCRIPT and object oriented simulation.
4. **Modeling of Communication Systems:**
 - a) Transmitter and Receiver subsystems
 - b) Communication Channels
 - c) Estimation of parameters in simulation and performance measures
5. Case studies in simulation using MATLAB or other Languages
 - a) Digital modulation techniques
 - b) Source and error control coding
 - c) Equalizers, transmitting and receiving filters and synchronization.

Text and Reference books:

1. Simulation of Communication Systems by Michel C. Jeruchim, Philip Balaban and K. Sam Shanmugam, Plenum Press N. Y.
- 2 System Simulation by Geoffrey Gordon, PHI Publication.
- 3 Contemporary Communication Systems using MATLAB by John P. Proakis