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 |
| **SEMISTER I** | | | | | | |
| 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 |
| **SEMISTER II** | | | | | | |
| 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 |
| **SEMISTER III** | | | | | | |
| 01 | Seminar on Special topics | | | | | 50 |
| 02 | Dissertation Seminar | | | | | 50 |
| | **TOTAL** | | | | | 100 |
| **SEMISTER IV** | | | | | | |
| 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 I
# Statistical Theory of Communication

1. **A Review of Scalar Random variables**
   The concept of random variable., distribution formulas of random variables expectation and moments, examples of random variables. Characteristics function $2^{nd}$ characteristic function random variables.

2. **Second Order Random Vectors:**
   Two-dimensional random variable, $2^{nd}$ order properties, random vectors, covariance matrices, sequence of second order random variables, Hilbert space of $2^{nd}$ order random variables.

3. **Multidimensional Random Variables:**
   Introduction, conditional distributions, functions, moments and cumulates, normal random vectors, convergence of random variables.

4. **Statistical Description Of Random Signals:**
   Family of different dimensional distribution, Conditional expectation, stationary random signals, linear filtering of signals, periodicity, continuity of continues time signals, point processes second order random signals.

5. **Statistical Description Of Random Signals:**
   Introductions white noises, random walks and Brownian motion, Gaussian Signals with stationary increments, spherically invariant and circular signals.

6. **Mean Square Estimation**:
   Introduction to statistical filtering, Linear statistical filtering without constraints sampling as estimation problem, linear statistical filtering with constraints, causality constraint, Wiener filtering, Statistical filtering of continuous time signals, Taylor expansions and estimations.

7. **Queuing Theory:**
   Poison points in random Intervals, Arrivals & Departures, single server Quere, shot noise, mark off, processes, Discrete and continuous time mark off chains, spectra of stochastic FM signals.

Text and Reference Books:


1) **Random Signals and Systems** – Bernard Picinbobo
   93 editions, Prentice Hall, Englewood city
2) **Probability, Random Variables & Stochastic Processes**
   --by A.Papoulus
3) **Stark & Wood –1**
4) **Proackis-Statistical Sign Pro.**

# COMMUNICATION NETWORKS

1. **Delay and loss Performance in network**
   Delay analysis
   Arrival rates and traffic load definition Lintel's formula

2. **Basic queuing models :**
   Arrival processes, service time queuing system clarification M/M/I queue and basic multiplexer model M/M/I state probabilities and notion of stability, effect of scale on performance, average placket delay Via network. The M/G/I model, service time variability and delay M/M/I system. Erlang formulas and M/M/c/e system priority queuing system.

3. **Communication network and service:**
   Network and services, Approached to network design, key factory in communication Network evolution.

4. **Application and layer architectures:**
   Examples of layering. OSI reference model, overview of TCP/IP Architecture the bazkley API Application protocols and TCP/IP utilities.

5. **TCP/IP:**
   The TCP/IP architecture, Internet protocols, user datagram protocols, transmission control protocols, DHCP and Mobile IP Internet routing Protocols routing.

6. **ATM network**
   Why ATM? BISDN reference Model. ATM layers, ATM adoption layers, ATM signaling PNNI Routing.

7. **Advanced Network Architectures:**
   Overplay Model, MPLS, Integrated services in Internet, RSVP, Differential service.

9. **Multimedia Information and networking**
   Lossless data compression
   Digital representation of analog signals Technique for increase in Compression.
   The real time transport protocol Session.

**Text and Reference Books:**


1) **Communication Network 2000 – Lession Available in TATA New EDN.**
2) **TCP/IP protocol smile – forouzan-**

# MICROWAVE INTEGRATED CIRCUITS

1. **Hybrid MICs.**
   Definition, Characteristics, Comparison with conventional circuits, fields of application and limitations and criteria for the choice of substrate material, thin film hybrid circuits, thick film hybrid circuits, artwork, mask making, photography, resistor stabilization, brazing process, wire bonding.

2. **Monolihic MICs:**
   Definition, substrate structure, doping by ion implementation ohmic contact, metal resistive layer, gate metal, dielectric second level metal, dielectric and air bridge vias, substance vias, final wafer process steps.

3. **Microstrip Lines:**
   Planar wave-guides, nonTEM propagation line impedance definitions quasi-static approximations, quas-static line parameters, micropstrips open circuits and gaps, microstrips corner step changes in width, dispersion analysis of microstrips characteristic impedance symmetric T junction, full wave analysis of propagation, LSE and I.S.M. potentials, spectral domain analysis, dispersion relation for open microstrip, spectral domain impedance analysis, Green's functions, millimeter wave modeling of microstrip lines.

4. **Coupled Line Propagation**:
   Wave equation for coupled lines, propagation model Wave equation for coupled lines, propagation models, coupled line parameters, coupled lines parameters variations with frequency, directional couplings, Lange coupler coupled line pair treated as a four port, coupled line pair operated as a two port assuming Oe = Oo, low pass filter design assuming Oe = Oo, coupled line analyzed to a port Oe net equal to Oo, narrow band filter using coupled resonator, narrow band coupled line filters, suspended substrate strip lined filters, suspended substrate strip line filter design using method1and 2.
5. **Slot lines:**
   Analysis design consideration, transitions and applications.
6. **Coplanar Wave guide:**
   Analysis, design consideration,
7. **Devices:**
   GaAs FET, Bipolar Transistors, Vector diodes, PIN diodes., YIC resonators, Dielectric resonators.

**Text and Reference Books:**


1. Microscopic Circuit Analysis – David H Schader, Prentice Hall PTR, New Jersey 07458.
2. Microstrip Lines and Slot Lines, K.C. Gupta R. Garg and I.J. Bahl, Artech House
3. Mic and MMIC amplifier and Oscillator Circuit Design 1990 edition,
4. MMIC Design GaAs FET's and HEMTs Peter Ladbrooke, Artech House.
5. Handbook of Microwave Integrated Circuits Reinmut K Hoffman, Artech House
6. Foundations for Microstrip Circuit design TC.Edwards, John Wiley and Sons
7. Design Considerations of Monolithic MIC's Robert A Pucel, IEEE Terms Microwave theory and Techniques Vol MTT

# ERROR CORRECTING CODES

1. **Introduction to Algebra:**
   Groups – Two arithmetic of Galosis fields
2. **Linear Block Codes:**
   Structure matrix description – syndromes decoding – Hamming Coca – Perfect Codes – Reed – muller Codes
3. **Cyclic Codes:**
   Polynomial description – matrix description – bamming Codes as cyclic Codes for correcting double error – cyclic Codes for correcting burst errors – the binary Golay code – shortened cyclic Codes.

4 **BCH and Reed Solomon Codes**
   Encoding and Decoding of BCH and Reed – Soloman Codes – The Berlecamp Massy algorithm – accelerated berlecamp Massey algorithm – MDS codes – nested Coades – Justeen Codes.

5. **Codes based on Spectral Techniques**
   Spectral description of cyclic Codes Extended Reed – Solomon Codes – extended BCH codes – Alter ant Codes – Goppa Codes – Preparata Codes – Product Codes.
6. **Convolutional Codes:**
   Convolutional encoders – Tree and Trllis diagram – convolutional Codes Correcting burst errors – the vierbi Decoding algorithm – Sequential decoding algorithm the 7 ano and the stack algorithm.
7. **Performance of Error Control Codes:**
   Eeight distributions – The Mac – Williams identities – Probabilities of decoding errors – Bounds on minimum distance for block Codes and Convolutional Codes.

**Text and Reference Codes:**


1. Theory and Practice of the error control Codes –
   By –Richard E. Blahut, Addison – Wesley Publishing
2. Errors Control Coding – Fundamentals & Applications –
   By – Lin and Costell
3. Theory of Error Correcting Codes
   By - Stephen B Wicker, Prenticel Hall
4. Theory of Error Correcting Codes –
   By – FJ Mac William And
5. Error Correcting Code – hand Sheet – Vera Plassa

# FIBRE OPTIC COMMUNICATION

1. Propagation of light in planar and Circular optical wave-guides, Characterization, fabrication and materials, dispersion an attenuation.

2. Coupled mode formulation, fiber wave-guide and wave guide coupling, directional couplers, electro optical sources and photo detectors.

3. Optical fiber links, non linear fiber optics.

**Text and Reference Books:**


1. Fiber Optic Communication – J. Keiser, McGraw Hill
2. Optical fibers for transmission – J. E. Midwinter, John Whiley
3. Optical communication systems – J. Gowar, Prentice Hall.
4. Optical fiber Telecommunications – S.E. Miller & Chynoweth
5. Non-linear fibers optics – G Agrawal, Academic Press.

# ANTENNA THEORY AND DESIGN

1. **Fundamental parameters of antennas:**
   Radiation pattern, radiation power density, radiation intensity, directivity, gain efficiency beam width, bandwidth, beam efficiency, polarization, input impedance etc.

2. **Loop Antenna:**
   Small circular loop, loop with constant current and non uniform current, ground and earth curvature effects for circular loop, polygonal loop antennas ferrite loop, mobile communication systems antennas.

3. **Arrays:**
   Linear arrays, planner arrays and circular arrays.
   N elements linear arrays: uniform amplitude and spacing & directivity for brad ride, end fire, phased array, Hansen Woodward end fire array. design procedure
   n element linear array for uniform spacing and non uniform amplitude. Super directivity, planar and circular array.

4. **Antenna Synthesis and continuous sources:**
   Schelkunoff polynomial method, founder transform method, Woodward law on method Taylor line source, amplitude and phase distribution.

5. **Frequency Independent Antennas:**
   Theory, equiangular spiral antennas, joy periodic antennas limits of electrically small antennas.

6. **Aperture antennas:**
   Huygen's principle, rectangular & circular apertures, design considerations, Babinet's principle, fourier transform in antenna aperature theory.

7. **Horn antennas:**
   E. Plane & H. Plane sectoral horn, pyramidal horn conical horn, aperature matched horns.

8. **Microstrip antennas:**
   Rectangular & circular patch, circular polarization and feed network.

9. **Reflector antennas:**
   Plane reflector, corner reflector, procedures, Radiation mechantsms Dielectric wave, dielectric resonator, dielectric horn antenna.

**Text and References:**


1. Antenna Theory – Constantine A Balanis, Wiley Publication
2. Antenna – John D