L: 3	EE641 Electromagnetic Field
T: 1	Theory: 100 marks
P: 0	Sessional: 50 marks
	Time: 3 hours

Vector Analysis

Review of dot and cross products, gradient, divergence and curl. Divergence and Stoke's Theorem, Cartesian, Cylindrical and Spherical Co-ordinate system. Transformation between co-ordinates, General curvilinear co ordinates. Value of gradient, divergence and curl in general co- ordinates and to obtain their values in cylindrical ans spherical co-ordinates.

The Static Electric Field

Coulomb's law, Electric field strength, Field due to pont charges, a line charge and a sheet of charge, Field due to continuous volume charge, Electric flux density, Gauss's law in integral form, Gauss's law in differential form(Maxwell's first equation in electrostatics), Applications of the Gauss's law.

Electrostatic potential difference and potential, potential and potential difference expressed as a line integral potential field of a point charge, potential field of a system of charges, conservative property, potential gradient, the dipole, energy density in the electrostatic field.

The static magnetic field

The Biot-Savart's law(the magnetic field of filamentary currents), the magnetic field of distributed surface and volume currents, Ampere's Circuital law in integral and differential form(Maxwell's curl equation for steady magnetic field)

The scalar and vector magnetic potentials, Maxwell's divergence equation for B, steady magnetic field laws, forces in magnetic field , force on a current element, force between two current elements, force and torque in the current loop.

The Electromagnetic field

Faraday's law in integral and differential form(Maxwell's first curl equation for electromagnetic field). The Lorentz force equation.

The concept of displacement current and modified Ampere's law(Maxwell's 2^{nd} curl equation for electromagnetic field), The continuity equation, power flow in an electromagnetic field, Poynting Vector.

Sinusoidally time varying fields, Maxwell's equations for sinusoidally time varying fields, power and energy considerations for sinusoidally time varying fields.

The retarded potentials, Polarization of vector fields, review of Maxwell's equations.

Materials and fields(review type only)

Current and current density, the continuity equation , conductor in fields.

Dielectric in fields: Polarization, flux density, electric susceptibility, relative permittivity,

Boundary conditions in perfect dielectrics, magnetic materials, magnetization, permeability, boundary conditions.

Applied Electromagnetics I

Poisson's and Laplace equations, solution of one dimensional cases, general solution of Laplace equation, Method of images.

Applied Electromagnetics II

Electromagnetic waves, The Helm Holtz equation, wave motion and free space, wave motion in perfect lossy dielectrics, propagation in good conductors, skin effect.
Reflection of uniform plane waves.
Radiation of electromagnetic waves.

Transmission line equations and parameters, some examples of transmission lines.

Text books and references:

1. Hayt: Engg. Electromagnetics.
2. Corson and Lofrain: Introduction to Electromagnetic fields and waves.

L: 3	**ET 662 Digital Communication**
T: 1	**Theory: 100 marks**
P: 3	**Sessional: 50 marks**
	Practical: 50 marks
	Time: 3 hours

Introduction
Introduction to digital communications, review of signals and systems theory, random variables, and Stochastic Processes. Merits of digital systems.

Waveform Coding Techniques
Mathematical models for information sources. Preview of sampling theorem. Sampling, quantizing and coding for discrete sources. Pulse code modulation (PCM). Quantization noise, companding, DPCM, DELTA modulation (DM), ADM. Noise in PCM and DM svstems. Time Division Multipexing(TDM).

Data Modulation and Demodulation

Vector Representation of waveforms. Modulation and Demodulation Based on Vector-Space Concept. Vector Channel Model. Optimum Detection with the AWGN Channel. Error Probability for the AWGN Channel

Signal Constellations and Modulation Techniques
Cubic and Orthogonal Constellations. Circular Constellations- M-ary Phase Shift Keying (PSK). Pulse Amplitude Modulation (PAM). Quadrature Amplitude Modulation (QAM).

Baseband Digital Transmission
Baseband binary PAM systems. Intersymbol interference (ISI). Nyquists's criterion for distortionless baseband binary transmission. Nyquist and Raised Cosine Pulses. Square-Root Splitting of the Nyquist Pulse. Baseband M-ary, PAM systems. Optimum detection. Matched filters, correlation receivers.

Passband System Analysis
Passband Representation. Equivalent Forms for a Passband Signal. Passband Channels and Their Baseband Equivalent. Baseband Equivalent AWGN Channel. Demodulators for the Generation of the Baseband Equivalent.

Error Control Coding

Error detection and correction. Parity check bit coding, block code. Examples of algebraic codes, convolution coding, combined modulation and coding. Trellis Coded Modulation.

Information Theory: Information measure, average information and entropy. Discrete memory less channels. Channel capacity theorem.

L: 3	**ET 663 Microprocessor And Embedded Systems**
T: 1	**Theory: 100 marks**
P: 3	**Sessional: 50 marks**
	Practical: 50 marks
	Time: 3 hours

Introduction to Computer Architecture and Organization: Architecture of 8-bit microprocessors, bus configurations, CPU module, introduction to assembly language and machine language programming, instruction set of a typical 8-bit microprocessor, subroutines and stacks, programming exercises.

Memory Technology: Timing diagrams, RAM, DRAM and ROM families, memory interfacing, programmable peripheral interface chips, interfacing of input-output ports, programmable interval timer. Memory map, peripheral I/O and memory- mapped I/O.

Data Transfer Schemes: Serial and parallel data transfer schemes, interrupts and interrupt service procedure. 8085 interrupts and vector locations, SIM and RIM instructions, RST instructions.

Introduction to Microcontrollers: Architecture, RISC and CISC processors.

Instruction Set and Programming: Instruction set and programming 8051micro controllers.

Architecture: Instruction set and programming of 8 bit micro controllers PIC 16c74.

Development Tools: Simulators, debuggers, cross compilers, in circuit emulators for the micro controllers.

Interface Issues Related to Embedded Systems: A/D, D/A converters, timers, actuators, power, FPGA, ASIC, diagnostic port.

Techniques for Embedded Systems: State machine and state tables in embedded design, simulation and emulation of embedded systems. High-level language descriptions of S/W for embedded system, Java embedded system design.

Real Time Models, Language and Operating Systems: Event based, process based and graph based models, Petrinet models. Real time languages, real time kernel, OS tasks, task states, task scheduling, interrupt processing, clocking, communication and Synchronization. Control blocks, memory requirements and control, kernel services.

Text Books/ References:

1. Ramesh S.Gaonkar - Microprocessor Architecture, Programming and Applications (3e), Penram Pub., 1997.
2. Mazidi M. A. & J. G. Mazidi - The 8051 Microcontroller and embedded systems, Pearson, 2002.
3. Kenneth J Ayala – the 8051 Microcontroller architecture programming and applications, 2nd Edition Penram International publishing.
4. J.B. Peatman – Design with PIC microcontrollers , PH Engg. 1998.

5. Hintz – Micro controllers, Architecture, implementation and programming McGraw Hill.
6. Evesham - Developing Real - Time Systems - A Practical Introduction , Galgotia Publications, New Delhi, 1996.
7. Ball S.R - Embedded microprocessor systems - Real World Design, Prentice Hall, 1996.
8. Herma K - Real Time Systems – Design for Distributed Embedded Applications, Kluwer Academic, 1997.
9. Gassle J - Art of Programming Embedded Systems, Academic Press, 1992.
10. Gajski D.D, Vahid F, Narayan S - Specification and Design of Embedded Systems, PRT Prentice Hall, 1994.

L: 3 T: 1 P: 3	**ET 664 Microwave Engineering** **Theory: 100 marks** **Sessional: 50 marks** **Practical: 50 marks** **Time: 3 hours**

Transmission Lines

Review of transmission line theory. Co-axial cable. MIC lines. Standing waves. VSWR and reflection coefficient. Smith chart. Stub matching calculation.

Waveguides

Rectangular and circular waveguides. Solution of wave equations. TE and TM modes. Dominant mode. Filed Patterns. Cut-off frequencies. Wave impedance. Power transmission. Waveguide resonators.

Network Representation

Scattering matrix parameters.

Components

Directional couplers, isolators, circulators, power splitters, E-. H- and magic Tees. Attenuators, phase shifters. Short circuit and matched terminations. Filters.

Microwave Devices

High frequency limitations. Klystrons, magnetrons, TWTs. Microwave transistors - bjts and GaAs MESFETs. Transferred electron devices, avalanche transit-time devices. Read diode, IMPATT diode. BARITT diode and the tunnel diode. Parametric devices. Quantum electronic devices. MASERS and LASERS. MICs.

Text Books/references:

1. S. Y. Liao - Microwave Devices and Circuits, Prentice Hall of India.

2. M. M. Radmanesh - Radio Frequency and Microwave Electronics, Pearson Education Asia.

3. R. E. Collin - Foundation for Microwave Engineering, McGraw-Hill.

4. K. C. Gupta - Microwaves. John Wiley and Sons.

L: 3	**ET 665 Computer Communication Networks**
T: 1	**Theory: 100 marks**
P: 0	**Sessional: 50 marks**
	Time: 3 hours

Uses of computer networks

Network goals, application structures, architectures, OSI Model and services. Network examples.

Physical layer

Transmission medium, telephone system. RS-232C, RS-449 standards. α21 switching, ISDN and terminal handling.

Medium access sublayer

ALOHA, CSMA, CSMA/CD, Collision free protocol, BRAP, MLMA etc. IEEE standard 802.3, Ethernet, token ring. FDDI, satellite networks and packet radio networks.

Data link layer

Framing, error detection and correction and data link protocols.

Network layer

Routing algorithm, flow control, queuing theory, analytical treatment of M/M/I and M/M/M.

Security and reliability of networks

Case study of' computer communication networks. TCP/IP.

Text books/references:

1. Dimitri Bertsekas & Robert Gallager – Data Networks. PHI, 1992, 2/e.
2. W. Stallings - Data and Computer Communications, Prentice Hall, 1997.
3. A. S. Tannenbaum - Computer Networks. PHI, 1997, 3/e.

L: 3 T: 1 P: 3	**ET 666 Data Structure** **Theory: 100 marks** **Sessional: 50 marks** **Practical: 50 marks** **Time: 3 hours**

Time and Space analysis of Algorithms – Order Notations.

Linear Data Structures : Sequential representations – Arrays and Lists, Stacks, Queues, Strings; Link Representations – Linear linked lists, Circular linked lists, Doubly linked lists; Applications.

Recursion – Design of Recursive Algorithms, Tail Recursion.

Nonlinear Data Structures : Trees – Binary Trees, Traversals and Threads, Binary Search Trees, Insertion and Deletion algorithms, Height Balanced Trees and Weight Balanced Trees, B-trees, B+ trees, Application of trees; Graphs – Representations, Breadth-first and Depth-first Search.

Hashing – Hashing Functions, Collision Resolution Techniques.

Sorting and Searching Algorithms : Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort.

File Structures: Sequential and Direct Access, Relative files, Indexed files, B+ tree aas index, Multi-index files, Hashed files.

Books:

1. Data Structures and Algorithms, A. V. Aho, J. E. Hoppcroft, J. E. Ullman, Addision Wesley.
2. Fundamentals of Data Structures, E. Horowitzz, S. Sahni, Galgotia Publ.
3. Data Structures using C, A. S. Tanenbaum
4. Algorithms, Data Structures, and Problem Solving, Addision Wesley.
5. Data Management and File Structures, Loomis, Marry, PHI
6. M. A. Weiss – Data Structures & Algorithm Analysis in C^{++}, Addison Wesley.
7. Lipshutz – Theory and Problems of Data Structures, McGraw Hill.
8. Neil Graham – Learning with C^{++}, McGraw Hill