T.E. (ELECTRONICS) SEMESTER V

Engineering Electromagnetics

Lectures: 3 hours / week	**Theory Paper: 3 hours and 100 marks**
Tutorial: 1 hours / week	**Termwork: 25marks**

Rationale

After having studied circuit theory, this subject exposes the student to the more exact field theory. Electromagnetic field theory deals directly with electric and magnetic field vectors, where as circuit theory deals with voltages and currents that are the integrated effects of electric and magnetic fields. An understanding of Electromagnetics is a must to appreciate Wave propagation, Antenna theory, Microwave and Optical fiber systems

Maxwell Equations:

Derivation of various basic electro magnetic laws using Maxwell's Equations, Conditions at a Boundary Surface, Basic idea of inductance & capacitance.

Electromagnetic waves

Solution of free space conditions, Uniform plane-propagation, Uniform plane waves, The wave equation for conducting medium, Sinusoidal Time Variations, Conductors & Dielectrics, Polarization, Direction cosines, Reflection by a perfect conductor-Normal Incidence, Reflection by a perfect conductor-Oblique Incidence, Reflection by a perfect dielectric-Normal Incidence, Reflection by a perfect insulator-oblique Incidence, Reflection at surface of a Conductive Medium, Surface Impedance, The Transmission-line analogy.

Poynting vector & flow of power

Poynting's Theorem, Note on interpretation of E×H, Instantaneous, Average & Complex Poynting vector, Power Loss in a Plane Conductor.

Guided Waves

Waves between parallel planes, Tranverse electric waves ($E_z \equiv 0$), Transverse Magnetic waves ($H_z \equiv 0$), Characteristics of TE & TM waves, Transverse electromagnetic waves, Velocities of propagation, attenuation in parallel-plane guides, Wave impedances, Electric field & current flow within the conductor, Transmission line, Circuit representation of of the parallel-plane transmission line, Parallel plane transmission line with loss, **E** & **H** about long parallel Cylindrical conductors of arbitrary cross section, Transmission –line theory, Low loss radio frequency & UHF transmission lines, UHF lines as circuit elements, Transmission-line charts, Impedance matching by means of stub lines.

Radiation

Potential Functions & the electromagnetic field, Potential functions for sinusoidal oscillations, The alternating current element (or Oscillating Electric Dipole), Power radiated by a current element, Application to short antennas, assumed current distribution, Radiation from a quarter-wave monopole or half-wave dipole, Sine integral & cosine integral, Electromagnetic field close to antenna, Solution of the potential Equations, Far-field approximation.

Transmission Lines Transmission Line equations, Transmission Line parameters, Transmission Line examples, Use of Smith Chart, Impedance matching.

Text Book

1. E. C. Jordan & K. G. Balmain-Electromagnetic Waves & Radiating Systems, PHI, Second Edition, 1988.

Additional Reading

1. John D Krauss – Engineering Electromagnetics, McGraw-Hill, sixth edition, 2001.
2. Edminister- Engineering Electromagnetics, Schaum series, Tata McGraw-Hill, second edition,1992.

Term work

Term work shall consist of at least eight tutorials based on the above syllabus out of which one tutorial should cover transmission line problems using Smith Chart. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

T.E. (ELECTRONICS) SEMESTER V

Electronic Measuring Instruments

Lectures: 3 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Termwork: 25marks**

Rationale:

The aim of the subject is that the student should get a through knowledge of all types of measuring instrument.. The basic concepts, working operation, capabilities & limitations of the instruments are discussed in the syllabus which will guide students in selecting instruments for various applications.

1. Introduction: Fundamentals of operational amplifier circuits, Principles of working of an electronic meter

2. Electronic Voltmeters: Principles of operation, advantages over conventional type analog voltmeters, factors involved in selection of voltmeters, basic voltmeter, peak reading, average reading true RMS reading, sampling type, FET voltmeters , sensitivity considerations & calculations.

3. Digital Voltmeters: Methods of analog-to-digital and digital-to-analog conversion, principles of operation and typical specifications of a digital voltmeter, description of various types of DVMs with block diagrams, Resolution and Sensitivity of a digital meter, digital displays for meters.

4. Frequency Meters: Analog-schematic & operational details, limitations. Digital Frequency meters, Time interval measurements, frequency ratio measurements

5. Phase Meters: Phase measurement by voltage addition method, balanced modulation type, phase meters using flip-flops, advantages & limitations of each type. Digital Phase meters for entire A.F. range & their limitations.

6. Oscilloscopes: Block diagram study of C.R.O., Description of panel layout & implementation of controls. Requirement of time base , triggered time base, delayed time base, external triggering etc.
Lissagios patterns, circular time base, intensity modulation, velocity modulation, use of these in phase & frequency measurements. Frequency time base, Wobbler scope & its applications, Dual trace, multi trace, Double beam, Sampling; Storage, Digital read-out oscilloscopes.
Use of CRO in square wave testing of amplifiers, tracing of diode & transistor characteristics.

7.Signal Generators : Requirement of a good laboratory type signal generator, A.F. signal genrators, Beat frequency oscillator & its advantages.

8. Q meter: Principle of operation, Sources of Error, Measurement of a).Stray capacitance ,b) Impedance , c) Characteristic impedance of transmission line using Q meter.

Text books:

1. Cooper W. D. & Helfrick A.D., Electronics Instrumentation & Measurement Techniques, third edition Prentice Hall of India, 1985
2. Kalsi H.S., Electronic Instrumentation, first edition, Tata McGraw Hill, 1997.
3. Doebelin E.O., Measurement Systems, Applications and Design, fourth edition,Tata McGraw Hill, 1990.
4. Oliver Cage, Electronic Measurements and Instrumentation, McGraw Hill ,1975.

Termwork:

The Termwork shall consist of at least eight experiments covering the whole syllabus, duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

T.E. (ELECTRONICS) SEMESTER V

Continuous Time Signals and Systems

Lectures: 4 hours / week	**Theory Paper: 3 hours and 100 marks**
Tutorials: 2 hours / week	**Termwork: 25marks**

Rationale:

This course elaborates the processing tools of analog domain signals and systems for time and frequency domain analysis. It is a pre-requisite for the course in Discrete Time signal Processing

1. **Signals**
   - Elementary Continuous Time (Ct) signals like unit step, Impulse, ramp, exponential, sinusoidal etc.
   - Operations on signal like shifting, flipping, scaling, addtion, multiplication
   - Breaking of a CT signal in different basic components
2. **Systems**
   - Concept of system modeling
   - Classification of system on the basis of linearity, time variance, causality, memory etc
   - System representation by a differential equation
   - System response in terms of Linear convolution integral
3. **The Fourier Series**
   - Orthogonal basis functions
   - Representation of a signal in terms of weighted Orthogonal basis functions
   - Calculation of weights (coefficients) in MSE sense
   - Extension to periodic signal in terms of Fourier Series Representation
   - Complex and Trigonometric Fourier Series
   - Properties of Fourier Series
   - Power Specral Density
4. **The Fourier Transform (FT)**
   - Definition & Properies
   - FT of basic signals
   - FT of periodic signals
   - Energy Specral Density
5. **Laplace Transform**
   - Review of Single sided Laplace transform, its properties and methods of Inverse Laplace transform
   - Two sided Laplace transform
   - Concept of region of convergence
   - Relationship between Laplace & Fourier Transform
6. **Time Domain behavior of a system**
   - Application of a Laplace Transform to a System differential equation
   - Transfer function & its properties for a linear, lumped & stable systems
   - Impulse response of a system
   - Zero input & zero state response of a system
   - Time domain analysis for a first and second order systems
   - Condition for BIBO stability in time domain
   - System response to complex exponential inputs

7. **Frequency Domain behavior of a system**
    - Pole-zero diagram
    - Frequency response of a system by analytical & graphical techniques.
    - Stability and Routh Array
    - Bode plot
8. **Analog to Digital conversion & Reconstruction**
    - Sampling theorem and Aliasing
    - Anti aliasing filter
    - Reconstruction

9. **State -Variable Techniques**
    - State –Variable concepts
    - State equations & their time domain and frequency domain solutions
    - State transition matrix
    - System state equations

Text Books

1. Ashok Ambardar, Analog and Digital Signal Processing: Thomson Learning Publication, second edition, first reprint, 2001
2. Taylor, Principles of Signals and Systems, McGraw-Hill International, 1994
3. M J. Roberts, Signals and Systems, first edition, Tata McGraw-Hill, 2003

Additional Reading:

1. Chen , System & Signal Analysis, Saunders college publishing, International second edition, 1994
2. S. Haykin, Signals and Systems
3. I.J. Nagrath, S.N. Sharan , R. Rajan and S Kumar, Signals and Systems, Tata McGraw Hill publication, 2001

Termwork:

The Termwork shall consist of at least six programs and at least four comprehensive assignments covering the whole syllabus, duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

T.E. (ELECTRONICS) SEMESTER V

Microprocessors & Microcontrollers

Lectures: 3 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 3 hours / week	**Termwork: 25marks**

Rationale:

This second course on Microprocessors discusses the organization, architecture and operation of the popular Intel MCS 8051 family of eight bit microcontrollers. It also lays an indepth foundation of sixteen bit microprocessors using the Intel 8086 family. The subject introduces the concept of multiprocessors.

Overview

Overview of microcomputer systems. Hardware and software principles.

Intel MCS 51 family

Introduction to Single chip microcontrollers of Intel MCS 51 family. Architectural and operational features. Its instruction set. CPU timing and machine cycles. Interrupt structure and priorities. Internal Timer / counters, serial interface. Connection of external memory. Power saving modes. Interfacing of 8051 with EPROM programming for EPROM versions. 8051 variations

Intel 8086/8088 microprocessor family

Architecture and organisation of 8086/8088 microprocessor family. Study of its Instruction set. Assembly language programming, Introduction to mixed language programming using C and Assembly language. 8086 family minimum and maximum mode operation. Timing diagram for 8086 family, detailed study of maximum mode connection: study of 8288 bus controller. 8086 interrupt structure.

Memory & I/O design

Memory system design for 8086 family including interface of dynamic Read/ write memory, timing considerations for memory interfacing. Connection of I/O Controllers 8255AH programmable peripheral Interface, Programmable Interrupt Controller 8259A, UART 8250, programmable D.M.A. Controller 8237. Data communications, EIA RS-232C serial interface and IEEE 488 General purpose interface. Error detection and correction - parity and cyclic redundancy check.

8087 Math Co-processor

Study of architecture of 8087 floating point co- processor. Data types supported by 8087. Host and co - processor interface, Assembly language Programming for 8086 - 8087 based systems.

Introduction to Multiprocessor systems

Multiprocessor configurations. Study of the 8289 bus arbiter. Design of 8086 based multiprocessor systems (without timing considerations).

Text Books:

1. John Uffenback, 8086 / 8088 Design, Programming and Interfacing, second edition, ninth Indian reprint, Prentice Hall of India, 2001
2. Kenneth Ayala, The 8051 Microcontrollers Architecture, Programming & Applications, Penram International (India)
3. Douglas Hall, Microprocessors interfacing and programming, Tata McGraw Hill, third edition

Additional Reading:

1. Muhammad A Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education Asia, first Indian reprint, 2002
2. John Uffenback, The 80X86 family Design, Programming and Interfacing, third edition, Pearson Education Asia, 2002
3. Intel Corporation, Data manuals

Termwork:

The Termwork shall consist of at least ten programs covering the whole syllabus and atleast one comprehensive design assignment duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

T.E. (ELECTRONICS) SEMESTER V
Electronics Workshop

Lectures: Nil hours / week	**Theory Paper: Nil**
Practicals: 3 hours / week	**Oral: 25marks**

Rationale:
Any student of Electronics Engineering degree course has to understand electronics troubleshooting techniques and soldering techniques. This subject introduces the student to these techniques. The subject also exposes the student to PC hardware in a practical way.

Soldering Soldering techniques, stripping and tinning stranded wires, installing and soldering tinned wires, mounting components – plated through hole and surface mount technology, hand soldering and wave soldering, de-soldering techniques, electrostatic discharge.

Analog Troubleshooting Electronics troubleshooting basics, troubleshooting with meters and Oscilloscopes, signal injection and signal tracing, system analysis, diagnostics and statistical methods, servicing close loop circuits, troubleshooting noise and intermittents.

Digital Troubleshooting Introduction to troubleshooting digital logic, use of logic probes, understanding and use of logic analyzers, working with microprocessor / microcontroller systems, use of logic analysis system for troubleshooting microprocessor / microcontroller systems, use of incircuit emulators.

PC Hardware PC hardware basics – how computers work, how software and hardware work together, system board, floppy and hard drives, troubleshooting fundamentals, supporting I/O devices, multimedia technologies, power supplies.

Textbooks:

1. H. (Ted) Smith, Quality hand soldering and circuit board repair, second edition, Delmar publishers
2. J. A. Sam Wilson, et. al., Electronic troubleshooting and servicing techniques Volume I, 1998, Howard W. Sams publication
3. Jean Andrews, Enhanced guide to managing and maintaining your PC, Enhanced third edition, 2001, Course Technology – Thomson learning publishers

Additional Reading:

Jan Axelson, The Microcontroller Idea Handbook, Penram Publishing (India) Pvt. Ltd., 2002

Termwork:

The termwork shall consist of atleast two laboratory experiments on designing, fabricating, testing and troubleshooting simple electronic circuits already studied, a visit to an electronic industry manufacturing electronic systems and using wave soldering machine and a report to be submitted. A mini project to design, fabricate, test and troubleshoot a simple digital electronic system based on a microprocessor / microcontroller.

Oral Exam:

A written quiz (fully objective) set by both internal and external examiners together shall carry a weightage of ten marks. Viva Voce based on mini project shall carry a weightage of fifteen marks.

T.E. (ELECTRONICS) SEMESTER VI

Microwave and Fiber Optic Communication

Lectures: 4 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Termwork: 25 marks, Oral: 25marks**

Rationale:

With ever-increasing need for more radio-frequency spectrum space, microwave communication and optical communication has grown rapidly. At shorter wavelengths, the conventional low frequency circuit analysis no longer suffices and hence knowledge of electromagnetic field theory is required for an adequate description of the electrical phenomenon taking place.

Introduction to Microwave communication, Microwave frequencies, Microwave devices and systems, Microwave applications.

Microwave waveguides and Cavities, Phase velocity and group velocity in waveguide, TE and TM modes in rectangular waveguides, Circular waveguides, Rectangular cavity resonator, Circular cavity resonator, Q-factor of a cavity resonator.

Microwave Components, S parameters, Properties of S parameters Attenuators, Tees, Directional Couplers, Circulators, Isolators – principle of working, S-matrix representation

Microwave Vaccum tube devices, Limitations of Conventional Vaccum tubes, Two Cavity Klystron Amplifier, Reflex Klystron – Operation, Mathematical analysis, performance and applications Cylindrical Magnetron, Helix TWT – Operation, performance and applications

Microwave solid state devices, Diode detectors, Diode mixer, Gunn diode, IMPATT and TRAPATT diodes, Parametric amplifier

Microwave measurements, Power, Frequency, VSWR,

Introduction to Optical Fiber Communication, Communication systems applications in the electromagnetic spectrum, Elements of an optical fiber transmission link, Advantages of optical fiber communication

Optical fiber waveguides, Fiber types, Ray theory transmission, Mode theory for circular waveguides, TE, TM and Hybrid modes, Single-mode and multi-mode fibers, Fiber materials, Fiber fabrication, Attenuation in optical fibers, Dispersion, Measurement of Attenuation and Dispersion.

Optical Devices, LEDs and Laser Diodes- working principle, structures, characteristics, modulation PIN and APD-working principle, characteristics, Couplers, Splices, Connectors

Optical fiber systems, Analog systems, Digital systems, Multiplexing, Link power budget, Rise-time budget

Text Books .

1. Samuel Y Liao - Microwave Devices and Circuits, Prentice Hall of India, third edition, 1997
2. John M Senior - Optical Fiber Communications, Prentice Hall of India, 1985

Additional Reading

1. Annapurna Das, Sisir K Das - Microwave Engineering, Tata McGraw Hill, 2000
2. Mynbaev and Scheiner - Fiber Optics Communications Technology - Pearson Education, 2001
3. Gred Keiser - Optical Fiber Communications, McGraw - Hill, second edition, 1991

Termwork:

The Termwork shall consist of at least eight experiments covering the whole syllabus, duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

T.E. (ELECTRONICS) SEMESTER VI

Analog Integrated Circuits & Applications

Lectures: 4 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 3 hours / week	**Termwork: 25 marks, Oral: 25marks**

Rationale

Though digital electronics has its advantages and flexibility, the physical world is inherently analog indicating a need for analog circuitry to condition physical signals such as those associated with transducers, as well as convert information from analog to digital domain for processing, and from digital back to analog for reuse in the physical world. This subject is a study of integrated circuit operational amplifiers and other linear integrated circuits and their applications.

Operational Amplifier Fundamentals

Basic Op Amp Configurations, Ideal Op Amp Circuits Analysis, Negative Feedback, Feedback in Op Amp Circuits, the Loop Gain, Op Amp Powering.

Circuits with Resistive Feedback

Current-to-Voltage Converters, Voltage-to-Currents Converters, Current Amplifiers, Difference Amplifier, Instrumentation Amplifier, Instrumentation Applications, Transducer Bridge Amplifiers.

Active Filter

The Transfer function, First-Order Active Filters, Audio Filter Applications, Standard Second-Order Responses, KRC Filters, Multiple-Feedback Filters, State-Variable and Biquad Filters, Sensitivity, Filter approximations, cascade design, generalized impedance converters, direct design, Switched capacitor filters.

Static Op Amp Limitations

Simplified Op Amp Circuits Diagram, Input Bias and Offset Currents, Low-Input-Bias-Current Op Amps, Input Offset Voltage, Low-Input-Offset-Voltage Op Amps, Input Offset-Error Compensation, Maximum Ratings.

Dynamic Op Amp Limitations

Open-Loop Response, Closed-Loop Response, Input and Output Impedances, Transient Response, Effect of Finite GBP on Integrator Circuits, Effect of Finite GBP on Filters, Current-Feedback Amplifiers.

Noise

Noise Properties, Noise Dynamics, Sources of Noise, Op Amp Noise, Noise in Photodiode Amplifiers, Low-noise Op Amps.

Stability

The Stability Problem, Stability in Constant-GBP Op Amps Circuits, Internal Frequency Compensation, External Frequency Compensation, Stability in CFA Circuits, Composite Amplifiers.

Nonlinear Circuits
Voltage Comparators, Comparator Applications, Schmitt Triggers, Precision Rectifier, Analog Switches, Peak Detectors, Sample-and-Hold Amplifiers.

Waveform Generators
Sine Wave Generators using Op-Amps, Multivibrators using Op-Amps, Monolithic Timer – NE555, Triangular Wave Generator using Op-Amps, Saw tooth Wave Generator using Op-Amps, Monolithic Waveform Generator - ICL8038, V-F and F-V Converters.

Voltage References And Regulators
Performance Specifications, Voltage References, Voltage-Reference Applications, Linear Regulators, Linear- Regulator Applications, Switching Regulators, Monolithic Switching Regulators.

D-A and A-D Converters
Sample and Hold Circuits, D-A Conversion Techniques, Multiplying DAC Applications, A-D Conversion Techniques, Performance Specifications, over sampling Converters.

Nonlinear Amplifiers and Phase-Locked Loops
Log / Antilog Amplifiers, Analog Multipliers, Operational Trans-conductance amplifiers, Phase-Locked Loops, Monolithic PLLs.

Operational Amplifier Circuit Design
Introduction, Differential Amplifier, current mirror, output stage, General Op-Amp circuit design, Detailed circuit description and working of 741 Op-Amp, small signal analysis, frequency response.

Text Books:

1. Sergio Franco, Design with operational amplifiers and analog integrated circuits, Third edition, McGraw Hill International edition, 2002.
2. James M. Fiore, Op Amps and Linear Integrated circuits, First reprint, Thomson Asia Pte. Ltd., 2001.
3. Robert Coughlin and F Driscoll, Operational Amplifiers and Linear Integrated circuits, sixth edition, Pearson Education Asia, 2001

Additional Reading:

1. Donald A. Neamen, Electronic Circuit Analysis and Design, Second edition, McGraw Hill International edition 2001

Termwork:
The termwork shall consist of atleast six laboratory experiments covering the whole of syllabus, duly recorded and graded as well as at least four computer simulations using EDA tools like PSPICE duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

T.E. (ELECTRONICS) SEMESTER VI

Communication Systems

Lectures: 3 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 3 hours / week	**Termwork: 25 marks, Oral: 25marks**

Rationale

Radio and TV broadcasting, Point –to-point and Mobile communications, Computer communications, Radar, Radio telemetry, Radio aids to navigation, Weather forecasting – this endless list of systems are all capable of providing rapid communications from every corner of the globe and even outer space. This subject is intended to give a basic understanding of some communication systems.

Antennas The half-wave dipole, Antenna characteristics, Ground effects, Effects of Antenna height, Antenna coupling, Antenna arrays, Special purpose Antennas, UHF and microwave Antennas.

Television Principles Television system and standards, The composite video signal, Blanking and Synchronizing pulses, Monochrome Television transmission and reception, Horizontal and Vertical deflection circuits, Synchronizing circuits, Colour transmission, Colour reception, Cable TV, Digital TV, HDTV.

Satellite Communication Kepler's Laws, Satellite orbits, Spacing and frequency allocation, Look angles, Orbital perturbations and corrections, Satellite Launching, Spacecraft subsystems, Satellite system link models, Link equations, Multiple access, Direct broadcast satellite services, Applications of LEO, MEO and Geo-stationary satellites.

Radar Systems Basic principles, Radar performance factors, MTI and Pulse Doppler radar, Continuous wave Doppler radar, Radar antenna, Phased array radars.

Text Books

1. Wayne Tomasi - Electronic Communication Systems, Pearson Education, fourth edition, 2001
2. Kennedy, Davis - Electronic Communication Systems, Tata McGraw - Hill, fourth edition, 1999
3. Roy Blake - Electronic Communication Systems, Thomson Learning, second edition, 2002
4. Gulati - Monochrome and Colour Television, New Age International (P) Limited, 1983

Additional Reading

1. Pratt, Bostian - Satellite Communication, John Wiley and Sons, 1986
2. Dennis Roddy - Satellite Communications, McGraw - Hill, third edition, 2001
3. Skolnik - Introduction to Radar Systems, McGraw - Hill, third edition, 2001
4. Gulati - Colour Television Principles and Practice, New Age International (P) Limited, 1988
5. Jordan, Balmian - Elecromagnetic Waves and Radiating Systems, PHI, second edition, 1988

Term work

The term work shall consist of at least four experiments and four assignments duly recorded and graded which shall carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

T.E. (ELECTRONICS) SEMESTER VI

Discrete Time Signal Processing

Lectures: 3 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Termwork: 25 marks, Oral: 25marks**

Rationale:

Today's need of fast speed, demands processing in discrete time. Many application areas therefore need a strong base in the subject "Discrete Time signal Processing". It is a pre-requisite for the course in Filter Theory & applications and Digital Communication

1. **Discrete Time (DT) signals & Systems**
   - Signal classification manipulations
   - Signal Periodicity in DT domain
   - Concept of system and System classification
   - System representation as a difference equation
   - Impulse Response
   - Finite Impulse Response (FIR) & Infinite Impulse Response (IIR) systems
   - Convolution
   - BIBO stability
2. **Z Transform**
   - Two-sided Z Transform and Region of Convergence (ROC)
   - Properties of Z Transform
   - Relationship with Laplace Transform & mapping
   - One-sided Z Transform
   - Inverse Z Transform
3. **Time Domain Analysis of DT Systems**
   - System Transfer function , System realizations using direct , cascade , parallel & Lattice forms
   - System Analysis : Impulse response, zero input & zero state response
   - Signal generation
4. **Frequency Domain Analysis of DT Systems**
   - System Transfer function and Pole-zero representation
   - Frequency domain analysis using Analytical & graphical techniques
   - System classification based on pass-band as Low pass, High pass, All pass, Band pass & Band reject
   - System classification based on phase response as Minimum phase , maximum phase , mixed phase or linear phase systems
   - Stability Analysis
5. **DT Signal Analysis & Computation of Spectra**
   - DTFS definitions from orthogonal complex exponentials
   - CTFS & DTFS and Properties of DTFS
   - Power Density spectrum
   - DTFT and Properties of DTFT
   - Energy Density spectrum
   - Relationship between DTFT & Z transform
6. **Discrete Fourier Transform (DFT)**
   - DTFT , DFT and DFT Properties
   - Block convolution using DFT by Overlap-add & Overlap-save methods
   - Fast Fourier Transform (FFT)

- Cooley – Tulkey Algoriths
- Prime Factor Algoriths

♦ Quantization effecs in Fixed- point FFT algorithns
♦ DFT analysis of Sinusoidal signals

7. DSP Processors

♦ Need for Special architecture
♦ Difference between DSP processor & microprocessor
♦ A general DSP processor

Text Books

1. Ashok Ambardar, Analog and Digital Signal Processing, Thomson Learning Publication, second edition, first reprint, 2001
2. Oppenheim & Schafer with Buck , Discrete – Time Signal Processing, Prentice Hall Signal processing series, Second edition, 2000
3. S.K. Mitra, Digital Signal Processing, Tata McGraw-Hill Publication

Additional Reading

1. T. J. Cavicchi, Digital Signal Processing, Wiley Publications, 2002

Termwork:

The Termwork shall consist of at least six programs and at least four comprehensive assignments covering the whole syllabus, duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

T.E. (ELECTRONICS) SEMESTER VI

Computer Organization

Lectures: 3 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Termwork: 25 marks, Oral: 25marks**

Rationale:
The subject of Computer Organization shall lay a strong fundamental base in understanding the functional and design aspects of various units of digital computer. The emphasis shall be on understanding of Hardware issues in computer design while addressing a number of software issues related to instruction execution, storage allocation etc.

Performance measure – Definition, Throughput and Response time, Measuring performance (MIPs, FLOPs etc.).

Preliminaries-Computer Arithmetic – Number representation and Arithmetic, Floating-point representation, Multiplication and Division algorithms and circuits. Operation on Data structures like Arrays, Lists, Stacks, and Queues.

Instruction types and sequencing, addressing modes with **case study for Pentium processor**

Input / Output Organization – I/O devices types and access methods, interrupts, DMA, I/O processors, types of busses and bus arbitration, various bus standards, I/O interface – serial and parallel ports

Basic Processing Unit – The data path and components of Instruction Execution, Bus Organization, Hardwired control, Micro-programmed control, Exceptions and their handling. Performance Enhancement using pipelining – Pipelining Introduction, Instruction set, Hazards, Case study

Memory organization – RAM organization – SRAM and DRAM, ROM and Flash memory, addressing, Cache – mapping , handling cache miss , multi level caches, Virtual memory – Concept , Address translation, paging, TLB, segmentation

Peripherals –
Storage Devices – Organization, Access techniques, Input andOutput devices - Organization, Access techniques, Network devices – modems, serial communication links

Multiprocessor systems– (Introduction only) Connection techniques, Cache issues

Text Books
1. Hamacher , Vranesic, Zaky ,Computer Organization , Fifth Edition, Tata McGraw-Hill, 2002.

Additional Reading

1. Patterson & Hennessy, Computer Organization, Second Edition, Morgan Kaufmann Publishers, 1998
2. John Carpinelli, Computer Systems Organization and Architecture, first Indian reprint, Addison Wesley Longman – Indian Branch, 2001

Termwork:

The Termwork shall consist of at least four experiments covering the whole syllabus, duly recorded and graded as well as six comprehensive tutorials. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.