COURSE STRUCTURE & SYLLABUS OF
BACHELOR OF TECHNOLOGY (B.TECH)

In

Electrical Engineering

Course Structure

Third Year

Fifth Semester

Paper Code	Subject
BTE1	Computer Organization
BTE2	Control System
BTE3	Power Systems
BTE4	Electrical Measurement - II
BTE5	Advanced Electrical Machines

BTE1 : COMPUTER ORGANISATION

1. INTRODUCTION

The Nature Of Computing, The Elements Of Computers, A Turing Machine To Add Two Unary Numbers, The Evolution Of Computers, Electronic Computers, Organization Of A First-Generation Computer, A Nonstandard Architecture: Stack Computers, The Vlsi Era.

2. BASIC ORGANIZATION AT THE COMPUTER

Logic gates, cpu organization

3. ROLE OF OPERATING SYSTEMS AND COMPILERS

Opening remarks, what is an operating system, early history: the 1940s and the 1950s, the 1960s, the emergence of a new field: software enginering , distributed computing, the key architectural trend: parallel computation, input-output trends, open systems, unix, ethical issues, application bases, the key operating systems for the 1990s, compilers, target-language choice

4. INSIDE A CPU

Data representation, fixed-point numbers, floating-point numbers,Number represented, instruction sets, instruction types, risc versus cisc, programming considerations, registers and storage, common bus system

5. COMPUTER ARITHMETIC AND THEIR IMPLEMENTATION

Fixed-point arithmetic, multiplication, twos-complement multipliers, division, division by repeated multiplication, arithmetic-logic units, combinational alus, controller design, introduction, hardwired control, microprogrammed control, the amd 2909 bit-sliced microprogram sequencer , Microinstruction addressing.

6. MEMORY AND IO ACCESS

Ascii alphanumeric characters, input-output interface, i/o bus and interface modules, i/o versus memory bus, asynchronous data transfer, handshaking, asynchronous serial transfer, asynchronous communication interface, first-in, first-out buffer, modes of transfer, interrupt-initiated i/o, priority interrupt, daisy-chaining priority, priority encoder, interrupt cycle, software routines, initial and final operations, direct memory access (dma), dma controller, dma transfer, input—output processor (iop), keyboard devices, mouse, output devices, sequential and direct-access devices, magnetic disk, types of hard disks, optical disk, optical disk drive

7. INSIDE THE MEMORY

Hierarchical Memory Technology, Random Access Memories (Rams), Bipolar Rams, Static Mos Rams, Dynamic Mos Rams, Inclusion, Coherence, And Locality, Memory Capacity Planning, Virtual Memory Technology, Memory Replacement Policies, Cache Addressing Models, Direct Mapping And Associative Caches, Set-Associative And Sector Caches, Cache Performance Issues

8. INTRODUCTION TO PIPELINED OPERATION AND ARCHITECTURE

General Considerations, Instruction Execution Phases, Mechanisms For Instruction Pipelining, Branch Handling Techniques, Computer Arithmetic Principles, Superscalar And Superpipeline Design, Superscalar Pipeline Design, Superpipelined Design, Supersymmentry And Design Tradeoffs, The Vliw Architecture, Vector And Symbolic Processors, Pipelining Hazards

9. INTRODUCTION TO MULTIPROGRAMMING AND MULTIPROCESSING

Characteristics Of Multiprocessors, Interconnection Structures, Parallel Processing, Multiprocessors, Cluster Computers

10. NON VON NEUMANN ARCHITECTURES

Data flow computers, the genesis of data-flow, interpreting data-flow graphs, static and dynamic data-flow architectures, criticisms of data flow, reduction computer architectures, multiple instruction, single data (systolic architectures)

BTE2 : CONTROL SYSTEM

1 INTRODUCTION TO CONTROL SYSTEM

Classification Of Systems, Open-Loop Control System, Closed-Loop Control Systems, Elements Of Automatic Or Feedback Control System, Requirement Of Automatic Control Systems

2 MATHEMATICAL MODELS OF CONTROL SYSTEM

Representation Of a Control System, Description Of Some Of Typical Physics System, Tachnogenerators, Potentiometers, LVDT and Synchros, Synchros, Hydraulic Actuation

3 BASIC PRINCIPLES OF FEEDBACK CONTROL

The Control Objectives, Feedback Control System Characteristics, Proportional Mode Of Feedback Control, Integral Mode Of Feedback Control, Derivative Mode Of Feedback Control

4 TIME DOMAIN ANALYSIS AND FREQUENCY RESPONSE

Standard Test Signals, Static Accuracy, Computation Of Steady State Errors, Transient Response: First Order System, Transient Response: Second Order System, Transient Response Specification, Conclusion, Frequency Response, Frequency Domain Specifications, Magnitude And Phase Angle Characteristics Plot, Frequency Response Specification, Representation Sinusoidal Transfer Function

5 CONCEPTS OF STABILITY AND THE ROUTH STABILITY CRITERION

Bounded-Input Bounded-Output Stability, Zero-Input Stability, The Routh Stability Criterion

6 NYQUIST STABILITY CRITERION

Stability Margin, Phase Margin

7 BODE PLOTS

8 ROOT LOCUS

The transfer function of a second order control system, General Rules

BTE3 : POWER SYSTEMS

1. LOAD CHARACTERISTICS

Introduction, advantages of electrical energy, load, connected load, demand, demand interval, maximum demand (md) or peak load, demand factor df, average load or average demand, load factor, diversity factor f_d, load diversity, utilization factor *fu*, Plant factor or capacity factor, loss factor f_{ls} , load curve, informations obtained from load curves , utility of load curves, Load-duration curve, procedure for plotting the load-duration curve, information available from load duration curve**,**

2. SUPPLY SYSTEM

Introduction, basic structure of an ac power system, distribution voltage level, sub transmission level, transmission level, layout of a power supply network, system interconnection, system voltages and transmission efficiency, working voltage, standardization of transmission voltages, classification of lines, comparison of conductor costs in various systems,

3. CONDUCTORS

Introduction, types of conductors, resistance, skin effect, equivalent copper section, kelvin's economy law, modified kelvin's law, graphical representation, economic current density.

4. POWER CABLES

Introduction, Cable Construction, Conductors, Insulation, Sheath, Protective Covering, Belted Cable, Screened Cable, Non-Drained Cable , Dielectric Stress, Grading Of Cables, Cable Capacitance, Charging Current Or Capacitive Current, Insulation Resistance, Dielectric Loss, Stress Distribution In A Hvdc Cable, Skin Effect, Proximity Effect**,**

5. LINE INSULATORS AND SUPPORTS

Introduction, types of insulator, v –strings, insulator materials, voltage distribution and string efficiency, improving voltage distribution, selection of insulation, line supports, wood poles, concrete poles, steel poles, supporting towers, vibration of conductors, effects of vibration on the transmission line, prevention of vibration, spacing of conductor

6. SAG AND TENSION

Introduction, sag and tension, parabolic method, catenary method, accuracy of results, loading on conductors, conductor clearance from ground, erection sag and tension, sag and tension charts, supports at unequal levels, the sag template, preparation of the sag template, method of using the template, economic span length .

7. LINE PARAMETERS

Introduction, line inductance, inductance of a conductor, external inductance, flux linkages in a group of conductors, inductance of a two-wire line, inductance of symmetrical three-phase line, Inductance of unsymmetrical three-phase line, two- wire line, symmetrical three-phase line, line capacitance, electric field of a long straight conductor, system of conductors, capacitance of two wire line, capacitance of the symmetrical three-phase line, interference between power and communication lines.

8. PER UNIT REPRESENTATION

Introduction, change of base, per unit impedance of a transformer, per unit quantities in three-phase systems, selection of base values, base quantities in terms of kv and mv a, per unit load impedance, one line diagrams, preparation of impedance diagrams

9. SHORT AND MEDIUM LINES

Introduction, classification of lines, short single-phase line, phasor diagram, short three-phase

line, transmission line as a two-port network, line regulation, line efficiency or transmission efficiency, line with transformers, medium lines, nominal t model of a medium line, nominal Π model of a medium line, calculation of transmission efficiency and regulation of medium lines,

10. LONG TRANSMISSION LINES

Introduction, exact solution of a long line, physical interpretation of the long line equations, propagation constant, wavelength and velocity of propagation, characteristic impedance $z_{0,}$ hyperbolic form of line equations, evaluation of abcd parameters, ferranti effect, surge impedance loading (sil),

11. CORONA

Introduction, the phenomenon of corona, theory of corona formation, the calculation of potential gradient, factors affecting corona, disruptive critical voltage, visual critical voltage, corona power loss, radio and television interference (ri), minimizing corona, bundled conductors

BTE4 : ELECTRICAL MEASUREMENT – II

1. **ANALOG INSTRUMENTS**

   Analog Instruments, Classification Of Analog Instruments, Principles Of Operation, Operating Forces, Constructional Details, Types Of Supports, Balancing, Torque/Weight Ratio, Control Systems, Damping Systems, Comparison Of Methods Of Damping, Methods Of Eddy Current Damping, Permanent Magnets, Pointers And Scales, Recording Instruments, Integrating Instrument

2. **GALVANOMETERS**

   Introduction, D' Arsonval Galvanometer, Torque Equation, Dynamic Behavior Of Galvanometers, Response Of Galvanometers, Operational Constants, Relative Damping, Logarithmic Decrement, Overshoot, Non-Dimensional Curves Of A Galvanometer Motion, Damping, Sensitivity, Galvanometer Shunts, Ballistic Galvanometer, Vibration Galvanometers

3. **OPTOELECTRONIC MEASUREMENT**

   Introduction, Monochromatic Light, Polarized Wave Shapes, Refraction And Refractive Index, Reflection, Absorbtion And Transmittance, Radiometry And Photometry, Terms Relating To Photometry, Laws Of Illumination, Terms Relating To Radiometry, Photometric/Radiometric Measurement Systems, Optical Sources, Optical Detectors

4. **MEASUREMENT OF POWER, ENERGY & INDUSTRIAL METERING**

   Power in d.c. Circuits, power in a.c. Circuits, electrodynamometer wattmeters, measurement of power using instrument transformers, three phase wattmeters, measurement of reactive power, general, motor meters, braking, friction, energy meters for a.c. Circuits, theory of induction type meters, polyphase energy meters, industrial metering and tariffs

5. **ELECTRONIC INSTRUMENTS**

   Introduction, electronic voltmeters and their advantages, vacuum tube voltmeters (vtvms), differential amplifier, difference amplifier type of electronic voltmeter, source follower type of electronic voltmeter, d.c. Voltmeter with direct coupled amplifier, true rms reading voltmeters, electronic multimeters, current measurements using electronic instruments, measurement of power at audio frequencies, voltmeter based instruments

6. **CATHODE RAY OSCILLOSCOPE**

   Introduction, Cathode Ray Tube (Crt), Electron Gun, Electrostatic Focusing, Electrostatic Deflection, Effect Of Beam Transit Time And Frequency Limitations, Deflection Plates, Screen

For Crts, Graticule, Aquadag, Colour Crt Displays, Time Base Generators, Oscilloscope Amplifiers, Vertical Input And Sweep Generator Signal Synchronization, Attenuators, Basic Cro Circuit, Accessories Of Cathode Ray Oscilloscopes

7. HIGH VOLTAGE AND MAGNETIC MEASUREMENTS, TESTING

Types Of Tests, Testing Apparatus, Equipment For Voltage Measurement, Localization Of Faults In High Voltage Cables, Testing Of Insulating Materials, High Voltage Testing Of Cables, Magnetic Measurements, Ballistic Tests, Permeameters, Alternating Current Magnetic Testing, Method Of Measurement Of Iron Losses

8. HIGH FREQUENCY MEASUREMENTS

Introduction, resonance methods, measurement of inductance, measurement of capacitance, measurement of effective resistance, resistance variation method, reactance variation method, t networks, parallel t network, bridge t network, q meter.

BTE5 : ADVANCED ELECTRICAL MACHINES

1 TRANSFORMER

Three winding transformer; Unbalanced operation of three phase transformer; Switching-in transients and mechanical forces.

2 ELECTROMECHANICAL ENERGY CONVERSION

Field energy- energy and co-energy; Torque/force in a singly excited and multiple excited electromechanical systems and applications.

3 D.C MACHINES

Flux and mmf waves; Commutation; Ward Leonard method; Braking; Parallel operation of generators; Dynamic equations, block diagrams and transfer functions.

4 SPECIAL D.C.MACHINES

Stepper Motors, Brushless Dc Motors, Variable-Reluctance Motors

5 POLYPHASE SYNCHRONOUS MACHINES

Basic Synchronous-machine Parameters, General Machine Equations, Three-phase Synchronous Machine (with no Amortisseurs), Balanced Steady-State Analysis , Synchronizing

6 POLYPHASE INDUCTION MACHINES

Transformations, Electrical Performance equations, High-torque Cage Motors, Induction Machine Dynamics.