

UTTARAKHAND TECHNICAL UNIVERSITY
SESSION 2009-10
STUDY AND EVALUATION SCHEME
B.Tech. Electrical Engineering
Year 4th Semester-VII

S.No	Course No.	Subject	Periods			Evaluation			Subject Total	
						Sessional Exam.		External Exam.		
Theory			L	T	P	CT	TA	Total		
1.	TEE 701	Power System Operation And Control	3	1	0	30	20	50	100	150
2.	TEE 702	Electric Drives	3	1	0	30	20	50	100	150
3.	TEE 703	Neural network and Fuzzy logic	3	1	0	30	20	50	100	150
4.		Elective -I	3	1	0	30	20	50	100	150
5.		Open Elective	3	1	0	30	20	50	100	150
Practicals / Design										
6.	PEE 751	Power System Lab	0	0	2	-	-	25	25	50
7.	PEE 752	Electric Drives Lab	0	0	2			25	25	50
8.	PEE 753	Industrial Training Seminar	0	0	2			50		50
9.	PEE 754	Project	0	0	2			50		50
	GP 701	General Proficiency	-	-	-	-	-	50	-	50
		Total	15	5	8			450	550	1000

STUDY AND EVALUATION SCHEME
B.Tech. Electrical Engineering
Year 4th Semester-VIII

S.No	Course No.	Subject	Periods			Evaluation			Subject Total	
						Sessional Exam.		External Exam.		
Theory			L	T	P	CT	TA	Total		
1.	TEE 801	Instrumentation and process Control	3	1	0	30	20	50	100	150
2.	TEE 802	EHV AC & DC Transmission	3	1	0	30	20	50	100	150
3.		Elective -II	3	1	0	30	20	50	100	150
4.		Elective -III	3	1	0	30	20	50	100	150
Practicals / Design										
5.	PEE 851	Instrumentation Lab.	0	0	2	-	-	25	25	50
6.	PEE 852	Project	0	0	2	-	-	100	200	300
7.	GP 801	General Proficiency	-	-	3	-	-	50	-	50
		Total	12	4	9	-	-	425	575	1000

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LIST OF ELECTIVE – I

- TEE 011: Utilization of Electrical Energy and Traction
- TEE 012: SCADA & Energy Management System
- TEE 013: Data Base Management System, Data Mining & Warehousing
- TEE 014: Digital Control System

LIST OF ELECTIVE – II

- TEE 021: Modern Control System
- TEE 022: Bio-Instrumentation
- TEE 023: Digital Signal Processing
- TEE 024: High Voltage Engineering

LIST OF ELECTIVE – III

- TEE 031: Power Quality
- TEE 032: Power Converter Application
- TEE 033: Computer Networks
- TEE 034: Operation Research

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TEE - 701 POWER SYSTEM OPERATION AND CONTROL

Unit I: Introduction

Structure of power system, power system control center and real time computer control, level decomposition in power system, power system security, various operational stages of power system, power system voltage stability, introduction to SCADA

Unit II: Economic operation

Concept and problems of unit commitment, input output characteristics of thermal and hydroplants, system constraints, Optimal operation of thermal units without and with transmission losses, penalty factor, incremental transmission loss, transmission loss, formula (without derivation), hydrothermal scheduling long and short terms, concept of optimal power flow

Unit III: Load frequency control

Concept of load frequency control, load frequency control of signal area system: turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response control area concept, P-I control, load frequency Control and economic dispatch control. Load frequency control of two area system tie line power modeling, block diagram representation of two area system, static and dynamic response

Unit IV: Automatic voltage control

Schematic diagram and block diagram representation, Different type of excitation system & their controllers.

Voltage and reactive power control

Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt compensation, series compensation, phase angle compensation

Unit V: State estimation

Detection and identification, linear and nonlinear models

Flexible ac transmission systems

Concept and objectives facts controllers: structures & characteristics of following facts controllers. TCR, FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC

Text books:

1. D.P. Kothari & Nagrath, "Modern Power System Analysis" Tata Mc Graw Hill, 3rd edition.
2. P.S.R.Murty, "Operation and Control in Power Systems" B.S. publications.
3. N.G. Hingorani & I. Gyugyi, "Understanding Facts "Concepts and Technology of Flexible AC Transmission Systems"
4. A.J. Wood & B.F. Wollenburg, "Power Generation, Operation and Control "John Wiley & Sons

Reference books:

1. O.J. Elgerd, "Electric Energy System Theory" Tata Mc Graw Hill.
2. P. Kundur, "Power System Stability and Control Mc Graw Hill.
3. M.H. Rashid, "Power Electronics: Circuits, Devices and Applications "Prentice Hall of India, 3rd edition.
4. T.K. Nagsarkar & M.S. Sukhiza, 'Power System Analysis' Oxford University Press

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TEE - 702 ELECTRICAL DRIVES

Unit I: Fundamentals of Electric Drive:

Electric Drives and its parts, advantages of electric drives, Classification of electric drives, Speed-torque conventions and multi-quadrant operations, Constant torque and constant power operation, Types of load, Load torque: components, nature and classification

Unit II: Dynamics of Electric Drive

Dynamics of motor-load combination; Steady state stability of Electric Drive; Transient stability of electric Drive

Selection of Motor Power rating:

Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty. Load equalization

Unit III: Electric Braking:

Purpose and types of electric braking, braking of dc, three phase induction and synchronous motors

Dynamics During Starting and Braking:

Calculation of acceleration time and energy loss during starting of dc shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking

Unit IV: Power Electronic Control of DC Drives

Single phase and three phase controlled converter fed separately excited dc motor drives (continuous conduction only); dual converter fed separately excited dc motor drive, rectifier control of dc series motor. Supply harmonics, power factor and ripples in motor current Chopper control of separately excited dc motor and dc series motor.

Unit V: Power Electronic Control of AC Drives

Three Phase induction Motor Drive

Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo - converter based) static rotor resistance and slip power recovery control schemes.

Three Phase Synchronous motor

Self controlled scheme

Special Drives

Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Text Books:

1. G.K. Dubey, "Fundamentals of Electric Drives", Narosa publishing House.
2. S.K.Pillai, "A First Course on Electric Drives", New Age International.

Reference Books:

3. M.Chilkin, "Electric Drives", Mir Publishers, Moscow.
4. Mohammed A. El-Sharkawi, "Fundamentals of Electric Drives", Thomson Asia, Pvt. Ltd. Singapore.
5. N.K. De and Prashant K.Sen, "Electric Drives", Prentice Hall of India Ltd.
6. V.Subrahmanyam, "Electric Drives: Concepts and Applications", Tata McGraw Hill.

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TEE - 703 NEURAL NETWORKS AND FUZZY LOGIC

Unit-I Neural Networks-1(Introduction & Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory

Unit-II Neural Networks-II (Back propogation networks)

Architecture: perceptron model, solution, single layer artificial neural network, multilayer perceptron model; back propogation learning methods, effect of learning rule co-efficient ;back propogation algorithm, factors affecting back propogation training, applications.

Unit-III Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory versus probability theory, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit-IV Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzifications, Fuzzy Controller,

Unit-V Application of Neural Network and Fuzzy logic

Application of neural network in load flow study, load forecasting, detection of faults in distribution system and electric drives control, Industrial applications of fuzzy logic.

Text Books:

1. Kumar Satish, "Neural Networks" Tata Mc Graw Hill
2. S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India.

Reference Books:

3. Siman Haykin,"Neural Networks "Prentice Hall of India
4. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.

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TEE - 011 UTILIZATION OF ELECTRICAL ENERGY AND TRACTION

Unit I: Electric Heating

Advantage & methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating,

Unit II: Electric Welding

Electric arc welding, electric resistance welding, Electric Welding control, Electrolyte Process: Principal of Electro deposition, laws of Electrolysis, application Electrolysis.

Unit No III: Illumination

Various definition, laws of Illumination, requirement of good lighting, Design of indoor lighting & outdoor lighting system.

Refrigeration and Air Conditioning

Refrigeration system, domestic Refrigerator, water cooler, Types of Air conditioning, Window air conditioner

Unit IV: Electric Traction – I

Types of electric traction, system of track electrification, Traction mechanics-types of services, speed time curve and its simplification, average and schedule speeds, Tractive effort specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence

Unit V: Electric Traction – II

Salient features of traction drives, Series-parallel control of dc traction drives (bridge traction) and energy saving, Power Electronic control of dc & ac traction drives, Diesel electric traction.

Text books:

1. H.Pratab. "Art & Science of Electric Energy's Dhanpat Rai & Sons.
2. G.K.Dubey, "Fundamentals of electric drives" Narosa Publishing house.

Reference Book:

1. H.Pratab."Modern electric traction" Dhanpat Rai & Sons.
2. C.L. Wadhwa,"Generation, Distribution and Utilization of Electrical Energy "New Age International Publishers.

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TEE - 012 SCADA & ENERGY MANAGEMENT

Unit I: SCADA

Purpose and necessity, general structure, data acquisition, transmission & monitoring, general power system hierarchical structure., Overview of the methods of data acquisition systems, commonly acquired data, data concentrators, various communication channels- cables, telephone lines, power line carrier, microwaves, fiber optical channels and satellites.

Unit II: Supervisory and Control Functions

Data acquisitions, status indications, majored values, energy values, monitoring, alarm and event application processing. Control Function: ON/ OFF control of lines, transformers, capacitors and applications in process in industry - valve, opening, closing etc., Regulatory functions: Set points and feed back loops, time tagged data, disturbance data collection and analysis. Calculation and report preparation.

Unit III: MAN- Machine Communication

Operator consoles and VDUs, displays, operator dialogues, alarm and event, loggers, mimics diagrams, report and printing facilities.

Unit IV: Data basis

SCADA, EMS and network data basis, SCADA system structure - local system, communication system and central, system. Configuration- NON-redundant- single processor, redundant dual Processor, multi control centers, system configuration. Performance considerations: real time operation system requirements, modularization of software programming languages.

Unit V: Energy Management Center

Functions performed at a centralized management center, production control and Load management economic dispatch, distributed centers and power pool management.

Text Books:

1. Torsten Cergrell, "Power System Control Technology", Prentice Hall International.
2. George L Kusic "Computer Aided Power System Analysis", Prentice Hall of India,

Reference Books:

1. A. J. Wood and B. Woolenberg, "Power Generation Operation and Control", John Wiley & Sons.
2. Sunil S Rao, "Switchgear Protection & Control System" Khanna Publishers 11th Edition.

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TEE - 013 DATABASE MANAGEMENT SYSTEM, DATA MINING AND WAREHOUSING

Unit I: Introduction

An overview of data base management system, data base system v/s file system, database system concept and architecture, data model schema and instances, data impedance and data base language and interfaces, data definitions language, DML, overall database structure.

Data modeling using the Entity Relationship Model:

ER model concept nation for ER diagram, aping constrains, keys, concept of super key, candidate key, primary key, generalization aggregation, reduction of an ER diagrams to tables extended ER model, relationship of higher degree.

Unit II Relational data model and language

Relational data model concepts, integrity constraints: entity integrity, referential integrity, keys constraints, and domain constraints relational algebra, relational calculus, tuple and domain calculus.

Introduction to SQL

Characteristics of SQL-Advantage of SQL data types and literals, types of SQL commands, SQL operators and their procedure tables, view and indexes quarries. And sub quarries. aggregate functions insert, update and delete operations, joins, unions, intersection, minus, cursors in SQL

Unit III: Data base design & Normalization

Functional dependencies, normal forms, first, second and third normal forms. BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, AND JDs, alternative approaches to data base design.

Unit IV: Foundation .Introduction to DATA Ware housing

Client/Server Computing model and data warehousing. Parallel process and system distributed DBMS implementations, Client/Server RDBMS Solutions.

Unit V: DATA Ware housing

Data warehousing components, building a data warehouse. Mapping the data warehouse to a multiprocessor architecture, DBMS Schemas for decision support. Data extraction, cleanup & transformation tools. Metadata.

Data Mining

Introduction to data mining.

Text books:

1. Korth, Silbertz, Sudrashan,"Database Concepts"Mc Graw Hill
2. Data C.J,"An Introduction in Data base System", Addition Wesley.
3. Alex Bersuon & Stephen J.Smith, 'data warehousing, data mining 7 OLAP", Tata MC Graw Hill
4. Mallach, Data Warehousing System", (MC Graw Hill)

Reference Books:

1. Elmasri, Navathe,"Fundamentals of database system", Addition Wesley
2. Bipin C Desai,"An Introduction to Database System,"Galgotia Publication.
3. Majumdar & Bhattacharya, "Database management system", MC Graw Hill
4. Ramkrishan, Gehrke,"Database Management System", MC Graw Hill

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TEE - 014 DIGITAL CONTROL SYSTEM

Unit I: Signal Processing in Digital Control

Basic digital control system, advantages of digital control and implementation problems, basic discrete time signals, z-transform and inverse z-transform, modeling of sample-and-hold circuit., pulse transfer function, solution of difference equation by z-Transform method.

Unit II: Design of Digital Control Algorithms

Steady state accuracy, transient response and frequency response specifications, digital compensator design using frequency response plots and root locus plots.

Unit III: State Space Analysis and Design

State space representation of digital control system, conversion of state variable models to transfer functions and vice versa, solution of state difference equations, controllability and observability, design of digital control system with state feedback.

Unit IV: Stability of Discrete System

Stability on the z-plane and Jury stability criterion, bilinear transformation, Routh stability criterion on r^{th} plane.

Lyapunov's Stability in the sense of Lyapunov, stability theorems for continuous and discrete systems, stability analysis using Lyapunov's method.

Unit: V Optimal digital control

Discrete Euler Lagrange equation, max. min. principle, optimality & Dynamic programming, Different types of problem and their solutions.

Text Books:

1. B.C.Kuo, "Digital Control System", Saunders College Publishing.
2. M.Gopal, "Digital Control and State Variable Methods", Tata McGraw Hill.

Reference Books:

3. J.R.Leigh, "Applied Digital Control", Prentice Hall, International
4. C.H. Houpis and G.B.Lamont, "Digital Control Systems: Theory, hardware, Software", Mc
5. Graw Hill.

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PEE – 751 POWER SYSTEM LAB

Note: - At least 10 experiments should be performed out of which 3 should be simulation based.

Hardware Based:

1. To determine direct axis reactance (X_d) and quadrature axis reactance (X_q) of a salient pole alternator.
2. To determine negative and zero sequence reactance's of an alternator.
3. To determine sub transient direct axis reactance (X_d') and sub transient quadrature axis reactance (X_q') of an alternator.
4. To determine fault current of L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation.
5. To study the IMDT over current relay and determine the time current characteristics.
6. To study percentage differential relay.
7. To study Impedance, MHO and Reactance type distance relays
8. To determine location of fault in a cable using cable fault locator
9. To study ferrety effect and voltage distribution in H.V. long transmission line using transmission line model.
10. To study operation of oil testing set.

Simulation Based Experiments (using MATLAB or any other software)

1. To determine transmission line performance.
2. To obtain steady state, transient and sub-transient short circuit currents in an alternator.
3. To obtain formation of Y-bus and perform load flow analysis.
4. To perform symmetrical fault analysis in a power system.
5. To perform unsymmetrical fault analysis in a power system

PEE – 752 ELECTRIC DRIVES LAB

Note: - At least 10 experiments should be performed out of which 3 should be simulation based.

Hardware Based Experiments:

1. To study speed control of separately excited dc motor by varying armature voltage using single-phase fully controlled bridge convertor.
2. To study speed control of separately excited dc motor by varying armature voltage using single-phase half controlled bridge convertor.
3. To study speed control of separately excited dc motor using single-phase dual converter (Static Ward-Leonard Control)
4. To study speed control of separately excited dc motor using MOSFET/IGBT chopper.
5. To study closed loop control of separately excited dc motor.
6. To study speed control of single-phase induction motor using single-phase ac voltage controller.
7. To study speed control of three-phase induction motor using three-phase ac voltage controller.
8. To study speed control of three-phase induction motor using three-phase current source inverter.
9. To study speed control of three-phase induction motor using three-phase voltage source inverter.
10. To study speed control of three-phase slip ring induction motor using static rotor resistance control using rectifier and chopper.
11. To study speed control of three-phase slip ring induction motor using static scherbius slip power recovery control scheme.

Simulation Based Experiments (using MATLAB or any other software)

1. To study starting transient response of separately excited dc motor.
2. To study speed control of separately excited dc motor using single phase fully/half controlled bridge converter in discontinuous and continuous current modes.

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3. To study speed control of separately excited dc motor using chopper control in motoring and braking modes.
4. To study starting transient response of three phase induction motor.

PEE – 753 INDUSTRIAL TRAINING SEMINAR

Students will go practical & Industrial training of four weeks in any industry or reputed organization after the VI semester examination in summer. They will also prepare an exhaustive technical report of the training which will be duly signed by the officer under whom training was taken in the industry/organization. They will have to present about the training before a committee consisting of faculty members constituted by the concerned head of the department.

PEE – 754 PROJECT

Project shall be assigned to students at the start of VII semester. There should not usually be more than 3 students in batch. The project should be based on latest technology as far as possible and it may be hardware or/and software based. The assessment of performance of students should be made at least twice in the semester. Students should be encouraged to present their progress of project using overhead projector or LCD projector.

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TEE – 801 INSTRUMENTATION AND PROCESS CONTROL

Unit I: Transducer – I

Definition, advantages of electrical transducers, classification, characteristics, factor affecting the choice of transducers, Potentiometers, Strain gauges, Resistance thermometer Thermistors, Thermocouples, LVDT, RVDT.

Unit II: Transducer – II

Capacitive, Piezoelectric Hall effect and opto-electronic transducers. Measurement of motion, Force pressure, temperature, flow and liquid level.

Unit III: Telemetry

General telemetry system, land line & radio frequency telemetering system, transmission channel and media, receiver & transmitter. Data Acquisition System:
Analog data acquisition system, modern digital data acquisition system, modern digital data acquisition system.

Unit IV: Display Devices and Recorders

Display devices, storage oscilloscope, spectrum analyzer, strip chart & x-y recorders, magnetic tape & digital tape recorders.

Recent Developments

Computer aided measurements, fibro optic transducers, microprocessors, and smart sensors smart transmitters.

Unit V: Process Control

Principal element of process control system, process characteristics, proportional (P), Integral (I), derivative (D), PI, PD & PID control modes. Electronic, Pneumatic & digital controllers.

Text Book

- 1 A.K Sawhney, "Advance measurement & instrumentation", Dhanpat Rai & Sons.
- 2 B.C Nakara & K Chaudhry, "instrumentation, measurement & analysis", Tata Mc Graw Hill 2nd Edition.
- 3 Curtis Johns, "Process Control Instrumentation Technology", Prentice Hall.

Reference book

- 1 E.O Decblin, "Measurement system-application & design", mc Graw Hill.
- 2 W.D Cooper & A.P Beltried, "Electronics Instrumentation and Measurement Techniques" Prentice Hall International.
- 3 Rajendera Prasad, "Electronic Measurement & Instrumentation Khanna Publisher.

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TEE – 802 EHV A.C. & D.C. TRANSMISSION

Unit I: Introduction

Need of EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC & DC transmission.

Unit II: EHV AC Transmission

Corona loss formulas, corona current, audible noise- generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferroresonance, reduction of switching surges on EHV system, principle of half wave transmission.

Unit III: Extra High Voltage Testing

Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers. Consideration for Design of EHV Lines, Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

Unit IV: EHV DC Transmission-I

Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters, principle of dc link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of dc link.

Unit V: EHV DC Transmission- II

Converter faults, protection against over currents and over voltage, Smoothing reactors, generation of harmonics, ac and dc filters, multi –terminal dc systems (MTDC): Types, control, protection and application

Text Books:

1. R.D. Begamudre, "Extra High Voltage AC Transmission Engineering "Wiley Eastern
2. K.R Padiyar, "HVDC power transmission System, Technology and System Reactions "new age international.
3. J Arrillaga, "High Voltage Direct current Transmission "IFFE Power Engineering Series 6, Peter Peregrinus Ltd. London.
4. M.S Naidu & V.K Kamaraju "High Voltage Engineering "Tata Mc Graw Hill.

Reference books:

1. M.H Rashid, "Power Electronics: Circuit, Devices and Applications "Prentice hall of India.
2. S .Rao, "EHV AC & HVDC Transmission Engineering and practice" Khanna Publishers.

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TEE – 021 MODERN CONTROL SYSTEM

Unit I: Introduction to control systems

Introduction to control systems, properties of signals and systems. Convolution integral, Ordinary differential equation, Transfer function, Pole zero concepts, effect of pole location on performance specification.

Unit II: State Space analysis

State equations for dynamic systems, State equations using phase, physical and canonical variables, realization of transfer matrices, Solution of state equation, concepts of controllability, observability, Controllability and Observability tests.

Unit III: Discrete time control systems

Sampling theorem, Sampled-data systems, the sample and hold element, pulse transfer function, The Z-transform, stability analysis.

Unit IV: Stability

Liapunov's method, generation of Liapunov's function, Popov's criteria, design of state observers and controllers, adaptive control systems, model reference.

Unit V: Optimal Control

Introduction, formation of optimal control problems, calculus of variation, minimization of functions, constrained optimization, dynamic programming, performance index, optimality principles, Hamilton – Jacobian equation, linear quadratic problem, Riccati II equation and its solution, solution of two point boundary value problem

Text Books:

1. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
2. M. Gopal, "Modern Control System", Wiley Eastern.

Reference Books:

3. B.D.O. Anderson and IB. Moore, "Optimal Control System: Linear Quadratic Methods", Prentice Hall International.
4. U. Itkis, "Control System of Variable Structure", John Wiley and Sons.
5. H. Kwakernaak and R. Sivan, "Linear Optimal Control System", Wiley Interscience.

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TEE – 022 BIO – INSTRUMENTATION

Unit I: Basic Physiological system of body

Problem encountering measuring leaving system, bioelectric potential, biomaterial

Basic transducers principle

Active and passive transducers, transducer for biomedical applications

Generation, propagation and distribution of bioelectric potential (ECG, EEG and EMG)

Unit II: Bio Potential Electrode

Basic type (micro skin surface and needle electrodes), Biochemical transducer (PH, blood gas and specification electrodes)

Cardiovascular System & Measurement

Heart and cardiovascular system and circulation block diagram blood pressure and measurement, characteristics of blood flow and heart sound, Electrocardiography, ECG an lead configuration, ECG recording and their types

Unit III: Nervous System

The anatomy of nervous system, neuronal communication, EPSP, IPSP, Organization of brain, Measurement from the nervous system

Systematic skin and body temperature measurement

Temperature measurement, Brief idea about ultrasonic measurements

Unit IV: Patient Care Monitoring

Element of intensive care, Organizational the hospital fore patient-care monitoring,

Pace makers-type, systems, mode and generators, Defibrillator-types.

Biotelemetry and application of telemeter inpatient care

Unit V: Automation of Chemical Test

Instrumentation for diagnostic X rays, Interfacing computer with medical instrumentation and other equipments, Bio medical computer application. Shock hazards from electrical equipments, methods of accident prevention.

Text Books:

1. Khandpur R.S. - Biomedical Instrumentation- TMH
2. Venkata Ram, S.K.-Bio-Medical Electronics & Instrumentation (Revised) - Galgotia.

Reference Books:

3. Cromwell- Biomedical Instrumentation and Measurements- PHI
4. Webster, J.G. –Bio- Instrumentation, Wiley (2004)
5. Ananthi, S. –A Text Book of Medical Instruments-2005-New Age International
6. Carr & Brown –Introduction to Biomedical Equipment Technology – Pearson
7. Pandey & Kumar-Biomedical Electronics and Instrumentation. - Kataria

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TEE – 023 DIGITAL SIGNAL PROCESSING

Unit I: Discrete- Time Signals And Systems

Sequences, discrete time systems, LTI systems, frequency domain representation of discrete time signals and systems, discrete time signals and frequency domain representation, Fourier transform.

Discrete Fourier Transform:

Discrete Fourier transforms, properties, linear convolution using DFT, DCT

Unit II: Sampling of Continuous Time Signals

Sampling and reconstruction of signals, frequency domain representation of sampling, discrete time processing of continuous time signals, continuous time processing of discrete time signals, changing the sampling rate using discrete time processing, multi rate signal processing, digital processing of analog signals, over sampling and noise shaping in A/D and D/A conversion.

Transform Analysis of LTI Systems

Frequency response of LTI systems, system functions, frequency response for rational system functions, magnitude-phase relationship, all pass systems, minimum phase systems, linear systems with generalized linear phase.

Unit III: Structures For Discrete- Time Systems

Block diagram representation, signal flow graph representation, basic structures for IIR systems: direct form, cascade form, parallel form, and feedback in IIR systems.

Transposed forms, basic network structures for FIR systems: direct form, cascade form, and structures for linear- phase FIR systems. Overview of finite precision numerical effects, effects of coefficient quantization, effects of round- off noise in digital filters, zero-input limit cycles in fixed point realizations of IIR digital filters.

Unit IV: Filter Design Techniques

Design of D-T IIR filters from continuous- time filters, design of FIR filters by windowing, Kaiser Window method, optimum approximations of FIR filters, FIR equiripple approximation.

Unit V: Efficient Computation of the DFT

Goertzel algorithm, decimation in time and decimation in frequency, FFT algorithm, practical considerations, implementation of the DFT using convolution, effects of finite register length.

Fourier analysis of Signals Using DFT

DFT analysis of sinusoidal signals, time- dependent Fourier transforms: block convolution, Fourier analysis of non- stationary and stationary random signals, spectrum analysis of random signals using estimates of the autocorrelation sequence.

Text Book:

1. Oppenheim A. V., Schafer, Ronald W. & Buck, John R., "Discrete Time Signal processing", Pearson Education, 2nd Edition.

Reference Books:

1. Proakis, J.G. & Manolakis, D. G., "Digital Signal Processing: "Principles, Algorithms and Applications", Prentice Hall of India.
2. Rabiner, L. R. & Gold B., "Theory and applications of DSP", Prentice Hall of India.
3. Oppenheim, Alan V. & Willsky, Alan S., "Signals and Systems", Prentice Hall of India, 2nd Edition.
4. Johnson, J. R., "Introduction to Digital Signal Processing", Prentice Hall of India.
5. De Fatta, D. J. Lucas, J. G. and Hodgkiss, W. S., "Processing" John Wiley and Sons

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TEE – 024 HIGH VOLTAGE ENGINEERING

Unit I: Break Down In Gases

Ionization processes, Townsend's criterion, breakdown in electronegative gases, time lags for breakdown, streamer theory, Paschen's law, breakdown in non-uniform field, breakdown in vacuum.

Break Down In Liquid Dielectrics

Classification of liquid dielectric, characteristics of liquid dielectric, breakdown in pure liquid and commercial liquid.

Break Down In Solid Dielectric

Intrinsic breakdown, electromechanical breakdown, breakdown of solid, dielectric in practice, breakdown in composite dielectrics.

Unit II: Generation of High Voltage and Currents

Generation of High direct Current Voltage, Generation of high voltage alternating voltages, generation of impulse voltages generation of impulse currents, tripping and control of impulse generators.

Unit III: Measurement of High Voltage and Currents

Measurement of High direct Current Voltages, Measurement of High alternating & Impulse voltages, Measurement of High direct, alternating & Impulse Currents, Cathode ray Oscillographs for impulse voltage and current measurements.

Unit IV: Over Voltage Phenomenon & insulation Coordination:

Lighting Phenomenon as natural cause for over voltage, over voltage due to switching surges and abnormal conditions, Principal of insulation coordination.

Unit V: Non -Destructive Testing

Measurement of direct current resistively, measurement of dielectric constant and loss factor, partial discharge measurements.

High voltage testing

Testing of insulator & bushing, testing of isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements.

Text Book:

1. M.S. Naidu & V. Kamraju," High voltage Engineering, Tata Mc-Graw hill.

Reference books:

2. E Kuffel and W.S.Zacngal , High voltage Engineering:, Pergamum Press
3. M.P Churasia, High Voltage Engineering Khanna Publishers.
4. R.S. Jha,"High voltage Engineering", Dhanpat Rai & Sons.
5. C.L. Wadhwa,"High Voltage Engineering", Wiley Eastern Ltd.
6. M.Khalifa," High Voltage Engineering theory and practice, "Marcel Dekker.
7. Subir Ray." An Introduction to High Voltage Engineering" Prentice Hall of India.

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TEE – 031 POWER QUALITY

Unit I: Power Quality Terms and Definitions

Introduction, transients, short duration/long duration voltage variations, voltage imbalance, waveform distortion, voltage fluctuations, power frequency variation.

Power Quality Problems:

Poor load power factor, loads containing harmonics, notching in load voltage, DC offset in loads, unbalanced loads, disturbance in supply voltage.

Unit II: Voltage Sags and Interruptions

Sources of sags and interruptions, end user issues: Ferro resonant transformer, on-line UPS, hybrid UPS, motor generator set, SMES etc., motor starting sags, utility system fault clearing issues.

Transient over Voltage

Sources of transient over voltages, principles of over voltage protection, devices for over voltage protection, utility capacitor switching transients, utility lightning protection, load-switching transient problems.

Unit III: Long Duration Voltage Variations

Devices for voltage regulation, utility voltage regulator applications, capacitors for voltage regulation, end-user capacitor application, regulating Utility voltage with dispersed sources.

Quality and Reliability of Power Supply

Reliability of power supply, reliability measurements consumer interruption cost, distribution automation, substation grounding, energy auditing.

Unit IV: Harmonics

Voltage and current harmonics distortions, harmonics of single-phase power supplies, three phase power converters, arcing devices, storable devices, effects of harmonics distortion, system response characteristics, locating sources of harmonics, peripherals for controlling harmonics, devices for filtering harmonics distortion, harmonics study procedure, symmetrical components, modeling harmonics sources, harmonic filter design, telecommunication interferences, computer tools for harmonic analysis.

Unit V: Wiring and grounding

Reason for grounding, typical wiring and grounding problems, solution of wiring and grounding problems.

Monitoring Power Quality

Power quality related standards, standard test waveform, and detailed power quality monitoring, power quality measurement equipments.

Custom Power Devices

Utility customer interface, network reconfiguring device load compensation using shunt compensators, voltage regulation using shunt compensators, dynamic voltage restorer, unified power quality conditioner.

Text Book:

1. Roger C.Dugan, Mark F. Mc Granhgan, Surya Santoso," Electrical Power System Quality"Mc Graw hill, 2nd Edition.
2. Arindam Ghosh and Gerard Ledwich,"Power Quality Enhancement using custom power devices ", Kulwer academic publishers.
3. C.L Wadhwa,"Generation and Distribution utilization of electrical Energy" New Age International.

Reference books:

1. C. Sankarm,"Power Quality" CRC Press USA.
2. Barry W. Kennedy, "Power Quality Primer "McGraw Hill.
3. Wilson E. Kazibwe,"Electrical power quality controls techniques" Van Nostrand Reinhold.

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TEE - 032 POWER CONVERTER APPLICATIONS

Unit I: HVDC Transmission

Schematic diagram; modes of operation, twelve pulse line commutated converters, effect of source inductance; control of HVDC converters, converter faults and protection, harmonic filters

Unit II: FACT Controllers

Principal of power transmission, principal of shunt compensation- and series compensation- TCR, TCS, SVC, STATCOM, Series compensator- TSSC, FCSC, TCSC, SSVC, phase angle compensator, unified power flow controller (UPFC), comparison of compensator

Unit III: Power Supplies

Desirable specification of power supply, draw back of linear power supply.

Switch mode power supply (SMPS)-schematic diagram, fly back converters, forward converter, push pull converters, half bridge and full bridge converter; uninterruptible power supply,(UPS)-configuration of line and online UPS, switch mode and resonant power supplies, air craft power supply.

Unit IV: Industrial Applications

High frequency inverters for induction and dielectric heating, ac voltage controllers for resistance heating and illumination control, high frequency fluorescent lighting, electric welding control.

Unit V: Interconnection of Renewable Energy Sources to the Utility Grid

Photovoltaic array interconnection, wind and small hydro interconnection, interconnection of energy storage system, DC circuit breaker, single phase and three phase ac switches, Excitation control of synchronous generator.

Text Books:

1. Ned Mohan, T.M. Undeland and William P. Robins, "Power Electronics: Converters, Applications and Design", John Wiley & Sons.
2. M.H. Rashid, "Power Electronics: Circuits, Devices and Applications" Prentice Hall of India.

Reference Books:

3. K.R. Padiyar, "HVDC Power Transmission: Technology and System Reactions" New Age International

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TEE – 033 COMPUTER NETWORK

Unit I: Introduction

Goals and applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design- Delay Analysis, Back Bone Design, Local Access Network Design. Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

Unit II: Medium Access Control sub layer

Medium Access sub layer- Channel Allocation, LAN protocols- ALOHA protocols- Overview of IEEE standards- FDDI, Data Link Layer-Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

Unit III: Network Layer

Network Layer- Point- to Point Networks, routing, Congestion control, internetworking- TCP/ IP- IP packet, IP address, IP v6.

Unit IV: Transport Layer

Transport Layer- Design issues, connection management, session Layer-Design issues, remote procedure call, Presentation Layer- Design issues, data compression techniques, cryptography- TCP Window Management.

Unit V: Application Layer

Application Layer- File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application, Example Networks- Internet and Public Networks.

Text Books:

1. Behrouz A. Forouzan, "Data Communication and Networking", Tata Mc Graw Hill.
2. A.S. Tanenbaum, "Computer Networks", 3rd Edition, prentice Hall India.
3. S. Keshav, "An Engineering Approach on Computer Networking", Addition Wesley.
4. W. Stallings, "Data and Computer Communication", Macmillan Press.

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TEE – 034 OPERATION RESEARCH

Unit I: Introduction

Operation Research -History nature and scope, allocation assignment and transportation models, construction & solution of these model.

Unit II: Linear Programming:

Introduction mathematical formulation of the problem. Graphical solution method mathematical solution of linear programming problem, slack, and surplus variable matrix formula of general linear programming problem.

Unit III: The Simplex Method:

Fundamental prosperities of solution, corroboration of extreme points. Simplex algorithm, computational procedure artificial variable two phase simplex method. Formulation of linear programming problems and its solution by simplex method.

Unrestricted variable problem of degeneracy

Principal of duality in simplex method formation of dual with mixed type of constraints. Solution of primal and dual (solution of dual contain solution of primal also) sensitivity analysis.

Unit IV: Inter Programming:

Formulation and solution of integer programming problem.

Game Theory:

Introduction of two persons zero sum games. the Maxmin and Minimax principles.

Unit V: Graphical Solution

Reduction of game problem to linear programming problem, transportation problem and its matrix form, initial basic feasible solution, selecting the entering variable, selecting the leaving variable transportation algorithm. Degeneracy in transportation problem. Inventory control.

Text Books:

1. D.S. Hira, "Operation Research", S. Chand Publications
2. Hillier, Lieberman, "Introduction to Operation Research", Tata Mc Graw Hill
3. Stevenson, "Operation Management", Tata Mc Graw Hill

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PEE – 851 INSTRUMENTATION LAB

Note: Minimum Eight experiments should be performed from the following, at least three experiments should be software based.

1. Measurement of displacement using LVDT.
2. Measurement of displacement using strain gauge based displacement transducer.
3. Measurement of displacement using magnetic pickup.
4. Measurement of load using strain gauge based load cell.
5. Measurement of water level using strain gauge based water level transducer.
6. Measurement of flow rate by anemometer.
7. Measurement of temperature by RTD.
8. Measurement of temperature BY THERMOCOUPLE.
9. Study of P, PI & PID controller.
10. Study of storage oscilloscope and determination of transient response of RLC circuit.
11. Determination of characteristics of a solid state sensor/fiber-optic sensor.
12. Design and test signal conditioning circuit for any transducer.
13. Study of data acquisition system using “**LAB VIEW**” software and test all signal points.
14. Measurement of sine, triangular, square wave signal of function generator and verify its frequency at 100 Hz tap point using “**LAB VIEW**” software.
15. Measurement of voltage and current signal of programmable power supply using “**LAB VIEW**” GPIB interface.

Note: Three more software based experiment may be added in place of experiments nos.13 to 15 at the institute level.

PEE – 852 PROJECT

Students should devote themselves to expedite progress of the project as soon as VIII semester starts. They are supposed to finish project work latest by middle of April and submit project report by the end of the April month. The assessment of performance of students should be made at least twice in the semester. The students should present project using overhead projector or power point presentation in the end semester project examination.