

UTTARAKHAND TECHNICAL UNIVERSITY
SESSION 2009-10
STUDY AND EVALUATION SCHEME
B.Tech. Electrical & Electronics 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 704	Switchgear & Protection	3	1	0	30	20	50	100	150
2.	TEE 702	Electrical Drives	3	1	0	30	20	50	100	150
3.	TEC 704	Digital Signal Processing	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.	PEC 755	Digital Signal Processing Lab	0	0	2	-	-	25	25	50
7.	PEE 751	Power System 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

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
- TEE 015: Neural Network and Fuzzy Logic

UTTARAKHAND TECHNICAL UNIVERSITY
SESSION 2009-10
SWITCHGEAR AND PROTECTION (TEE – 704)

Unit No. 1

Introduction to Power System

Introduction to protective system and its elements, functions of protective relaying, protective zones, primary and backup protection, desirable qualities of protective relaying, basic terminology.

Relays

Electromagnetic, attraction and induction type relays, thermal relay, gas actuated relay, design Considerations of electromagnetic relays

Unit No. II

Relay Applications and characteristics

Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay

Static relays

Comparison with electromagnetic relays, classification and their description, over current relays, directional relay, distance relays, differential relay

Unit III

Protection of Transmission Line

Time graded protection, Differential and Distance protection of feeders, choice between Impedance, Reactance and Mho relays, Elementary idea about carrier current protection of lines, protection of bus, auto reclosing, pilot wire protection

Unit IV

Circuit Breaking

Arc phenomenon, Properties of arc, arc extinction theories, , Recovery Voltage and Restriking Voltage, current chopping, resistance switching, capacitive current interruption, , circuit breaker ratings.

Testing of Circuit breakers

Classification, testing station and equipments, testing procedure, direct and indirect testing

Unit V

Apparatus protection

Types of faults on alternator, Stator and rotor protection, Negative sequence protection, Loss of excitation and overload protection. Types of fault on transformers, percentage differential protection, Ungrounded neutral system, Grounded neutral system and Selection of Neutral Grounding.

Circuit breaker

Need for circuit breakers, types of circuit breakers, operating modes, principles and constructional details of Air Blast, Bulk Oil, Minimum Oil, SF₆, Vacuum Circuit Breakers , D.C. circuit breakers

Text Books:

- 1) Switchgear and Protection Sunil S. Rao (Khanna Publishers)
- 2) Power System Engg. Soni Gupta & Bhatnager (Dhanpat Rai&Sons)
- 3) A Course in Electrical Power C.L.Wadhawa (New Age international Pvt. Ltd)
- 4) Power system protection and switchgear B.Ram (Wiley Eastern Ltd.)

Reference Books:

- 1.) Power system Protection & Switchgear Badriram & D.V.Vishwakarma (TMH)
- 2) Switchgears & Protection M.V. Deshpande (THM)

UTTARAKHAND TECHNICAL UNIVERSITY
SESSION 2009-10
TEC – 704 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

UTTARAKHAND TECHNICAL UNIVERSITY

SESSION 2009-10

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.

UTTARAKHAND TECHNICAL UNIVERSITY
SESSION 2009-10
TEE – 015 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 perception 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.

UTTARAKHAND TECHNICAL UNIVERSITY

SESSION 2009-10

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.

UTTARAKHAND TECHNICAL UNIVERSITY

SESSION 2009-10

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.

UTTARAKHAND TECHNICAL UNIVERSITY

SESSION 2009-10

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 DATAWare housing

Client/Server Computing model and data warehousing. Parallel process and system dstrubuted 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

UTTARAKHAND TECHNICAL UNIVERSITY

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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-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.

UTTARAKHAND TECHNICAL UNIVERSITY
SESSION 2009-10
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 – 753 INDUSTRIAL TRAINING SEMINARS

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.

PEC – 755: Digital Signal Processing Lab.

Note:- Minimum of 10 experiments should be performed out of the following using DSP kit TMS 320 CXX.

- 1 To generate sinusoidal, square and triangular waveforms
- 2 To study response of audio (analog) input
- 3 To study response and stability of linear shift invariant system with given unit sample response
- 4 To study addition and multiplication of sequences
- 5 To study matrix multiplication
- 6 To find discrete Fourier Transform of given sequence
- 7 To implement Geartzd Algorithm
- 8 To implement FFT decimation in time algorithm
- 9 To implement floating point arithmetic
- 10 To implement Tone generation
- 11 To implement LPC computation
- 12 To implement Coding schemes

UTTARAKHAND TECHNICAL UNIVERSITY
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PEE – 754 PROJECTS

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.