

UTTARAKHAND TECHNICAL UNIVERSITY DEHRADUN
STUDY AND EVALUATION SCHEME

B. TECH. YEAR 3RD, SEMESTER-V
ELECTRICAL & ELECTRONICS ENGINEERING
 (Effective from session 2008-09)

S .No	Course No.	Subject	Periods			Evaluation			Subject Total	
						Sessional Exam.		Exam ESE		
Theory			L	T	P	CT	TA	Total		
1.	THU 501	Industrial Economics & Principles of Management	3	1	0	30	20	50	100	150
2.	TEE 501	Electromechanical Energy Conversion-II	3	1	0	30	20	50	100	150
3.	TEE 502	Control System	3	1	0	30	20	50	100	150
4.	TEE 503	Elements of Power System	3	1	0	30	20	50	100	150
5.	TEC 507	Analog Integrated Electronics.	3	1	0	30	20	50	100	150
Practicals/Design										
6.	PEE 551	Electromechanical Energy Conversion-II Lab.	0	0	2	-	25	25	25	50
7.	PEE 552	Control System Lab.	0	0	2	-	25	25	25	50
8.	PEC 557	Electronics Lab.-II	0	0	2	-	25	25	25	50
		Total								900
9.	*GP 651	General Proficiency*	-	-	-	-	-	100	-	100
10.	*DIS 651	Discipline*	-	-	-	-	-	100	-	100

** The marks of General Proficiency & Discipline will be awarded at the end of even semester.*

INDUSTRIAL ECONOMICS AND PRINCIPLES OF MANAGEMENT (THU 501)

Industrial Economics:

Unit –1.Introduction: Nature and significance of Economics. Meaning of Science, Engineering and Technology and their relationship with economic development.

Unit –2. Basic Concept: The concept of demand and supply. Elasticity of Demand and Supply. Indifference Curve Analysis, Price Effect, Income Effect and Substitution Effect.

Unit –3. Money and Banking: Functions of Money, Value of Money, Inflation and measures to control it. Brief idea of functions of banking system, viz., Commercial and central banking, Business fluctuations.

Management:

Unit –4. Introduction: Definition, Nature and Significance of Management, Evaluation of Management thought, Contributions of Max Weber, Taylor and Fayol.

Unit –5. Human Behaviour: Factors of Individual Behaviour, Perception, Learning and Personality Development, Interpersonal Relationship and Group Behaviour.

References:

1. Dewett, K.K. / *Modern Economic Theory*/S.Chand & Co.
2. Luthers Fred/ *Organizational Behaviour*.
3. Prasad L.M./ *Principles of Management*.
4. A.W. Stonier & D.C. Horgne / *A TextBook of Economic Theory*/ Oxford Publishing House Pvt. Ltd.

TEE – 501: Electro-mechanical Energy Conversion - II

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Unit No.	Topic Name
I.	Synchronous Machine I Constructional features, Armature winding, EMF Equation, Winding coefficients, equivalent circuit and phasor diagram, Armature reaction, O. C. & S. C. tests, Voltage Regulation using Synchronous Impedance Method, MMF Method, Potier's Triangle Method, Parallel Operation of synchronous generators, operation on infinite bus, synchronizing power and torque co-efficient
II	Synchronous Machine II: Two Reaction Theory, Power flow equations of cylindrical and salient pole machines, Operating characteristics Synchronous Motor: Starting methods, Effect of varying field current at different loads, V-Curves, Hunting & damping, synchronous condenser
III	Three phase Induction Machine – I Constructional features, Rotating magnetic field, Principle of operation Phasor diagram, equivalent circuit, torque and power equations, Torque- slip characteristics, no load & blocked rotor tests, efficiency, Induction generator
IV	Three phase Induction Machine- II Starting, Deep bar and double cage rotors, Cogging & Crawling, Speed Control (with and without emf injection in rotor circuit.) Single phase Induction Motor Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, repulsion motor.
V	AC Commutator Motors: Universal motor, Single phase a.c. series compensated motor, stepper motors

Text Books:

1. D.P.Kothari & I.J.Nagrath, "Electric Machines", Tata Mc Graw Hill
2. Ashfaq Hussain "Electric Machines" Dhanpat Rai & Company

Reference Books:

1. P.S.Bimbhra, "Electrical Machines", Khanna Publisher
2. P.S. Bimbhra, "Generalized Theory of Electrical Machines", Khanna Publishers
3. M.G.Say, "Alternating Current Machines", Pitman & Sons
4. O.C. Taylor, "The performance & design of A.C. Commutator Motors", A.H.Wheeler & Co(P) Ltd.
5. Fitzgerald, A.E., Kingsley and S.D. Umans "Electric Machinery", MC Graw Hill.

TEE-502 Control System

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Unit No.	Topic Name
1	The Control System: Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback
2	Time Response analysis: Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems, performance indices
3	Control System Components: Constructional and working concept of ac servomotor, synchros and stepper motor Stability and Algebraic Criteria concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations Root Locus Technique: The root locus concepts, construction of root loci
4	Frequency response Analysis: Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots Stability in Frequency Domain: Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles
5	Introduction to Design: The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain. Review of state variable technique: Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing.

Text Book:

1. Nagrath & Gopal, "Control System Engineering", 4th Edition, New age International.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India.

Reference Books:

1. Norman S. Mise, Control System Engineering 4th edition, Wiley Publishing Co.
2. M.Gopal, "Control System; Principle and design", Tata McGraw Hill.
3. M.Gopal, "Modern Control system", Tata McGraw Hill.
4. D.Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.

TEE - 503: Elements of Power Systems

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- Unit No. Topic Name**
- 1 **Power System Components:**
Single line Diagram of Power system,
Brief description of power system Elements:
Synchronous machine, transformer, transmission line, bus bar , circuit breaker and isolator.
Supply System
Different kinds of supply system and their comparison, choice of transmission voltage
Transmission Lines:
Configurations, types of conductors, resistance of line, skin effect, Kelvin's law.
Proximity effect
- 2 **Over Head Transmission Lines**
Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines,
Representation and performance of short, medium and long transmission lines, Ferranti effect.
Surge impedance loading
- 3 **Corona and Interference:**
Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference.
Electrostatic and electromagnetic interference with communication lines,
Overhead line Insulators:
Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency.
- 4 **Mechanical Design of transmission line:**
Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers.
Insulated cables:
Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables.
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Text Books

1. W. D. Stevenson, "Element of Power System Analysis", McGraw Hill, USA
2. C. L. Wadhwa, "Electrical Power Systems" New age international Ltd. Third Edition
3. Asfaq Hussain, "Power System", CBS Publishers and Distributors, India
4. B. R. Gupta, "Power System Analysis and Design" Third Edition, S. Chand & Co.
5. M. V. Deshpande, "Electrical Power System Design" Tata Mc Graw Hill.

Reference Books

1. M. V. Deshpandey, "Elements of Power System Design", Tata McGraw Hill, India
2. 2.Soni, Gupta & Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & Sons, India
3. S. L. Uppal, "Electric Power", Khanna Publishers, India
4. S.N.Singh, " Electric Power Generation, Transmission& distribution." PHI, New Delhi

TEC 507: Analog Integrated Electronics

Frequency response & stability of an Op-Amp:

Frequency response, compensating Networks, Frequency response of internally compensated and uncompensated Op-Amps, High frequency Op- Amps. Equivalent circuit, stability in constant GBP Op-Amp. Circuits

Op-Amp Circuits: Linear Applications:

Current to voltage converters, V to I converters, current amplifier, difference Amplifiers, Instrumentation Amplifiers, Integrators & Differentiator.

Active filters & Converters:

First and second order low pass & High pass filters, Band Pass & Band-Reject filters, All-Pass filter, Filter using MATLAB. Voltage to Frequency and Frequency to voltage Converters, Analog to Digital and Digital to Analog Converters.

Non Linear Circuits & Regulators:

Voltage Comparators, Schmitt Triggers, Precision Rectifiers, Analog Switches Peak detectors, sample and Hold circuit, square and Triangular Wave Generators, Linear Regulators Switching Regulators.

Non linear Amplifiers & Phase-Locked Loops: Log/Antilog Amplifiers, Analog Multipliers, Operational Trans conductance Amplifiers (OTA), Phase-Locked Loops, Monolithic PLLs, Noise in Integrated Circuits.

Text Books:

1. Franco Sergio, "Design with Operational Amplifiers and Analog Integrated Circuits" Tata McGraw-Hill
2. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits" Prentice Hall of India.

Reference Books :

1. James M.Fiore, "Op-Amps and Linear Integrated Circuits: Theory and Applications" Thomson Asia Pvt. Ltd. Singapore
2. Millman J.&Halkias C.C., "Integrated Electronics Analog and Digital Circuits & Systems" McGraw Hill.
3. Soclof,S., "Application of Analog Integrated Circuits" Prentice Hall of India.
4. Bell, David A., "Operational Amplifiers & Linear ICS" Prentice Hall of India.

PEE – 551: Electro-mechanical Energy Conversion – II Laboratory

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Note: The minimum 8 experiments are to be performed from the following, out of which there should be at least two software based experiments.

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit.
2. To perform load test on a three phase induction motor and draw:
 - (i) Torque -speed characteristics
 - (ii) Power factor-line current characteristics
2. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.
3. To study speed control of three phase induction motor by Keeping V/f ratio constant
4. To study speed control of three phase induction motor by varying supply voltage.
5. To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i) EMF method (ii) MMF method.
6. To determine V-curves and inverted V-curves of a three phase synchronous motor.
7. To determine X_d and X_q of a three phase salient pole synchronous machine using the slip test and draw the power-angle curve.
8. To study synchronization of an alternator with the infinite bus by using:
 - (i) dark lamp method
 - (ii) two bright and one dark lamp method

Software based experiments (Develop Computer Program in 'C' language or use MATLAB or other commercial software)

9. To determine speed-torque characteristics of three phase slip ring induction motor and study the effect of including resistance, or capacitance in the rotor circuit.
10. To determine speed-torque characteristics of single phase induction motor and study the effect of voltage variation.
11. To determine speed-torque characteristics of a three phase induction motor by (i) keeping v/f ratio constant (ii) increasing frequency at the rated voltage.
12. Draw O.C. and S.C. characteristics of a three phase alternator from the experimental data and determine voltage regulation at full load, and unity, 0.8 lagging and leading power factors.
13. To determine steady state performance of a three phase induction motor using equivalent circuit.

Note: The minimum of 10 experiments are to be performed from the following, out of which at least three should be software based.

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output V/S input characteristics
7. To determine speed-torque characteristics of an ac servomotor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behaviour of separately excited dc motor in open loop and closed loop conditions at various loads.
10. To study PID Controller for simulation proves like transportation lag.

Software based experiments (Use MATLAB, LABVIEW software etc.)

11. To determine time domain response of a second order system for step input and obtain performance parameters.
12. To convert transfer function of a system into state space form and vice-versa.
13. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' for stability.
14. To plot a Bode diagram of an open loop transfer function.
15. To draw a Nyquist plot of an open loop transfer function and examine the stability of the closed loop system.

Reference Books:

1. K.Ogata, "Modern Control Engineering" Prentice Hall of India.
2. Norman S.Nise, "Control System Engineering", John Wiley & Sons.
3. M.Gopal, "Control Systems: Principles & Design" Tata Mc Graw Hill.

Note: The minimum of ten experiments are to be performed from the following:

1. To study biasing of common-emitter transistor using voltage divider method and determine dc quiescent operating point.
2. To study common-emitter amplifier and determine voltage gain, current gain, input impedance and output impedance.
3. To study R-C coupled two-stage common-emitter amplifier and determine voltage gain, current gain, input impedance and output impedance.
4. To study single stage RC-coupled FET amplifier.
5. To study transistor as a switch and determine load voltage and load power when the transistor is ON.
6. To study common-collector amplifier and determine voltage gain, current gain, input impedance and output impedance.
7. To study RC phase shift oscillator.
8. To study Wein bridge oscillator.
9. To determine CMRR of a differential amplifier.
10. To study op-amp based inverting and non-inverting amplifiers and the voltage comparator.
11. To study op-amp based Adder and integrator circuits.
12. To study an RC active filter.
13. To study Op-amp based triangular wave generator.
14. To study a PLL circuit and determine the free running frequency, capture range and lock range.