

**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	Text Book Nos	Chapter Nos	Page Nos	No. of Lectures
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	1/2	5, 6, 8/ 3	202-210,284-294,413-445,484-486/3.1-3.55,3.81-3.112	9
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	1/2	8/ 3,5	445-490/3.56-3.81, 5.1-5.51	7

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	1/2	9/4	522-564/ 4.1-4.42	8
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.)	1 / 2	9 / 4	572-606 / 4.43-4.100	7
V	Single phase Induction Motor Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, repulsion motor.	1 / 2	10 / 8,9	629-688 / 8.1- 8.3, 9.1-9.23	4
	AC Commutator Motors: Universal motor, Single phase a.c. series compensated motor, stepper motors				5

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	Text Book Nos	Chapter Nos	Page Nos	No.of Lectures
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	1, 2	1, 1	2-08, 6-7	1
		1	2	46-83	5
		1	3	93-102	1

2	Time Response analysis: Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants	1	5	194-214	3
	Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems, performance indices	1	5	215-226	5
3	Control System Components: Constructional and working concept of ac servomotor, synchros and stepper motor	1	4	138-142, 148-163	3
	Stability and Algebraic Criteria concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations	1	6	270-291	3
	Root Locus Technique: The root locus concepts, construction of root loci	1	7	299-320	3
4	Frequency response Analysis: Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots	1	8	346-365	5
	Stability in Frequency Domain: Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles	1	9	376-413	3
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.	1	10	426-475	5
	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.	1	12	586-596, 599-504, 617-625	4

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	Text Book Nos	Chapter Nos	Page Nos	No. of Lectures
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	1	6	155-157	2
		3	2	15-25	3
		3	3,4	30-39, 66	3
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	2	2,3	13-52	4
		3	7	126-164	
		2	4	55-91	4
		3	9,10	194-228	
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.	2	6	135-146	3
		3	22	468-480	
		2	6	146-148	1
		2	8	169-183	3
		3	9	78 - 88	
		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.	2	7
3	6			102-109	
				115-116	
2	9			184-221	4
3	4	46-73			
5	Neutral grounding: Necessity of neutral grounding, various methods of neutral grounding, earthing transformer, grounding practices. Electrical Design of Transmission Line: Design consideration of EHV transmission lines, choice of voltage, number of circuits, conductor configuration, insulation design, selection of ground	3	24	499-505	3
		2	11	246-256	
		4 / 5	17 / 6	544-553 / 186-203	3

wires. EHV AC and HVDC Transmission: Introduction to EHV AC and HVDC transmission and their comparison, use of bundle conductors, kinds of DC links, and incorporation of HVDC into AC system.	4	14,15	459-461, 478-483	3
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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 - 506: Communication Engineering

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Unit No.	Topic Name	Text Book Nos	Chapter Nos	Page Nos	No. of Lectures
1	Amplitude Modulation :	1	3	35-43	1
	Amplitude modulation,	1	4	56-74	2
	DSBSC, SSB and VSB modulation and demodulation schemes	1	3,6	43-52, 120-144	4
	AM transmitters and receivers, super-hetrodyne receiver, IF amplifiers, AGC circuits Frequency division multiplexing.	1	15	564-566	1
2	Angle Modulation:	1	5	80-89	1
	Frequency modulation, phase modulation	1	5	100-112	2
	Generation of frequency modulation	1	6	158-164	2
	FM receivers and demodulators	1	2	15-25	2
	Noise: External noise, internal noise, Noise calculations, signal to noise ratio Noise in AM and FM systems	2	2	132-147	2
3	Pulse Communication				
	Sampling Process,	2	3	184-188	1
	PAM,PWM,PPM and PCM,	1	13	494-507	2
	Delta modulation and adaptive delta modulation	2	3	218-223	1
	Digital Modulation:	2	6	232-233 344-353	4

	Introduction, brief description of phase shift keying (PSK), Differential phase shift keying (DPSK), frequency shift Keying (FSK), Quadrature amplitude modulation (QAM) and time division multiplexing (TDM).			380-386 414-417 211-214	
4	Radio Propagation: Ground waves, sky wave propagation, space waves, tropospheric scatter propagation, Satellite Communication- transponders, Geo-stationary satellite system, low earth and medium earth-orbit satellite system. Introduction to Cellular system Personal communication system (PCS), data communication with PCS.	1 3 3 3	8 12 10 11	236-249 454-464 472-482 366-384 422-444	2 3 1 1
5	Television: TV systems and standards, scanning and synchronizing, common video and sound circuits, vertical and horizontal deflections, colour transmission and reception. Fibre Optical Communication: Optical fibre and fibre cables, fibre characteristics and classification, fibre optic components and systems.	1 1	17 18	651-697 709-722	5 3

Text Books :

1. G. Kennedy and B. Davis , “Electronic Communication Systems” Tata McGraw Hill
2. Simon Haykin, “ Communication Systems” John Wiley & Sons

Reference Books :

1. Roy Blake, “ Wireless Communication Technology” Thomson Asia Pvt. Ltd. Singapore
2. B. P. Lathi, “Modern Analog and Digital Communication Systems” Oxford University Press.
3. Taub & Schilling, “Principles of Communication Systems” McGraw Hill.

TEE – 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
3. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.

4. To study speed control of three phase induction motor by Keeping V/f ratio constant
5. To study speed control of three phase induction motor by varying supply voltage.
6. 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.
7. To determine V-curves and inverted V-curves of a three phase synchronous motor.
8. 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.
9. 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)

10. 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.
11. To determine speed-torque characteristics of single phase induction motor and study the effect of voltage variation.
12. 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.
13. 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.
14. To determine steady state performance of a three phase induction motor using equivalent circuit.

TEE – 552: Control System Laboratory

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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.

TEC 556: Communication Engineering Laboratory:

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Note: A minimum of 10 experiments is to be performed.

1. To study amplitude modulation using a transistor and determine depth of modulation.
 2. To study generation of DSB-SC signal using balanced modulator.
 3. To study generation of SSB signal
 4. To study envelop detector for demodulation of AM signal and observe diagonal peak clipping effect.
 5. To study super heterodyne AM receiver and measurement of sensitivity, selectivity and fidelity.
 6. To study frequency modulation using voltage controlled oscillator.
 7. To detect FM signal using Phase Locked Loop.
 8. To measure noise figure using a noise generator.
 9. To study PAM, PWM and PPM.
 10. To realize PCM signal using ADC and reconstruction using DAC and 4 bit/8bit system. Observe quantization noise in each case.
 11. To study Delta Modulation and Adaptive Delta Modulation.
 12. To study PSK-modulation system.
 13. To study FSK-modulation system.
 14. To study sampling through a Sample-Hold circuit and reconstruction of the sampled signal and observe the effect of sampling rate & the width of the sampling pulses.
- To study functioning of colour television

TEE - 601 : Power System Analysis

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Unit No.	Topic Name	Text Book Nos	Chapter Nos	Page Nos	No. of Lectures
1	Representation of Power System Components: Synchronous machines, Transformers, Transmission lines, One line diagram, Impedance and reactance diagram, per unit System.	1,3	6,4	127-162 95-124	2
	Symmetrical components: Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.	1,2,3	11,13,10	275-302, 299-309, 369-392	3
	Symmetrical fault analysis: Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions.	1,2,3	10,12,09	248-260, 257-265, 327-343	2
2	Unsymmetrical faults: Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance.	1,2,3	12,1,11	305-333, 306-342, 397-415	5
	Formation of Z_{bus} using singular transformation and algorithm, computer method for short circuit calculations.	5	3,4,6	40-44, 79-92, 167-184	5
3	Load Flows: Introduction, bus classifications, nodal admittance matrix (Y_{BUS}), development of load flow equations, load flow solution using Gauss Siedel and Newton-Raphson method, approximation to N-R method, line flow equations and fast decoupled method.	1,2,3	18,8,6	612-643, 193-222, 184-235	8
4	Power System Stability: Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement.	1,2,3	14,17,12	373-420, 549-611, 433-505	8
5	Traveling Waves: Wave equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings. Bewlay's lattice diagram, protection of equipments and line against traveling waves.	4	12,13,	762-776, 779-797	7

Text Books:

1. W.D. Stevenson, Jr. "Elements of Power System Analysis", Mc Graw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. Kothari & Nagrath, "Modern Power System Analysis", Tata Mc Graw Hill.
4. Chakraborty, Soni, Gupta & Bhatnagar, "Power System Engineering", Dhanpat Rai & Co.
5. Stagg and El-Abiad, "Computer Methods in Power System Analysis" Tata Mc Graw Hill

Reference Books:

1. L. P. Singh; "Advanced Power System Analysis & Dynamics", New Age International
2. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.
3. A. R. Bergen and V. Vittal; "Power System Analysis", Pearson Publication.

TEE – 602: Conventional And Computer Aided Design of Electrical Machines**L T****P****3 1 0**

Unit No.	Topic Name	Text Book Nos	Chapter Nos	Page Nos	No. of Lectures
1	Basic Considerations:				
	Basic concept of design, limitation in design, standardization, modern trends in design and manufacturing techniques,	1; 2	1; 1	1-6, 1-7	1
	Classification of insulating materials.	1; 2	2; 2	29-30;28-29	1
	Modes of heat dissipation & temperature rise-time curves.	1; 2	3; 3	35-42,74-84; 41-51	2
	Methods of cooling ventilation (induced & forced, radial & axial), direct cooling & quantity of cooling medium.	1; 2	3; 3	55-58;64-74; 53-57,62	2
2	Calculation of total mmf and magnetizing current.	1	3	122-134,176-178	2
	Specific permeance and leakage reactance.	1	3	152-154	1
	Transformer Design:				
2	Output equation design of core, yoke and windings, overall dimensions,	1; 2	7; 5	375-399;116-142	7
	Computation of no load current to voltage regulation, efficiency and cooling system designs.	1; 2	7; 5	419-428; 142-152	
3	Design of rotating machines – I:				
	Output equations of rotating machines, specific electric and magnetic loadings, factors affecting size of rotating machines, separation of main dimensions, selection of frame size.	1	8	454-473	3
4	Core and armature design of dc and 3-phase ac machines	1	9,10,12	497-538;568-570,602-612, 740-758	5
	Design of rotating machines – II:				
	Rotor design of three phase induction motors.	1	10	613-632	2
4	Design of field system of DC machine and synchronous machines.	1	9,12	539-547,758-772,778-779	3
	Estimation of performance from design data				2

		1	10,9,12	632-645,575-578,774	
5	Computer Aided Design Philosophy of computer aided design, advantages and limitations.	1; 2	16,9	865-866, 437-438	1
	Computer aided design approaches analysis, synthesis and hybrid methods.	1; 2	16,9	866-869, 434-442	2
	Concept of optimization and its general procedure.	1; 2	16,9	869-870,442-443	1
	Flow charts and 'c' based computer programs for the design of transformer, dc machine, three phase induction and synchronous machines.	2	10	444-467	5

Text Books :

1. A. K. Sawhney, "A Course in Electrical Machine Design" Dhanpat Rai & Sons.
2. K.G. Upadhyay, "Conventional and Computer Aided Design of Electrical Machines" Galgotia Publications.

Reference Books :

1. M.G. Say, "The Performance and Design of AC Machines" Pitman & Sons.
2. A.E. Clayton and N.N. Hancock, "The Performance and Design of D.C. Machines" Pitman & Sons.
3. S.K. Sen, "Principle of Electrical Machine Design with Computer Programming" Oxford and IBM Publications.

TEE – 603: Power Electronics

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Unit No.	Topic Name	Text Book Nos	Chapter Nos	Page Nos	No. Of Lectures
1	Power semiconductor Devices:	1	1	5-12	1
	Power semiconductor devices their symbols and static characteristics	1	1	16-23	1
	Characteristics and specifications of switches, types of power electronic circuits	1; 2	4; 10	123-137; 604-616 137-150; 651-656 & 667-674	3
	BJTO operation steady state and switch characteristics, switching limits	1; 2	4; 10	304-311; 7-13& 19-21	2
	Operation and steady state characteristics of MOSFET and IGBT	1;2	7; 1	318- 321, 325-328;	2
	Thyristor – Operation V- I characteristics, two transistor model, methods of turn-on	1; 2	7; 10	684-686, 719-720, 590-595	
	Operation of GTO, MCT and TRIAC				
2	Power Semiconductor Devices(Contd)	1; 2	18; 11	803-817; 754-776	2
	Protection of devices.	2	3	110-116&120-127	2
	Series and parallel operation of thyristors	2	1	24-40	
	Commutation techniques of thyristor				
	DC-DC Converters:	1; 2	5; 6	166-185; 387-419	3
	Principles of step-down chopper, step down				

	chopper with R-L load Principle of step-up chopper, and operation with RL load, classification of choppers				
3	Phase Controlled Converters Single phase half wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode. Single phase fully controlled and half controlled bridge converters. Performance Parameters Three phase half wave converters Three phase fully controlled and half controlled bridge converters, Effect of source impedance Single phase and three phase dual converters	2; 1 2; 1 2; 1 2; 1 1	4; 10 4; 10 4; 10 4; 10 10	134-141; 432-434 151-167; 434-438 & 467-472 187-144; 443-451&474-478 200-209; 492-493 440-443&453-455	1 2 2 1 2
4	AC Voltage Controllers Principle of On-Off and phase controls Single phase ac voltage controller with resistive and inductive loads Three phase ac voltage controllers (various configurations and comparison) Single phase transformer tap changer. Cyclo Converters Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation	1; 2 1; 2 2 1; 2 2; 1	11; 9 11; 9 9 11; 9 7; 11	501-505; 537-538 506-513; 538-548 555-561 522-526; 549-553 476-490&494-496; 526-534	1 2 1 1 2
5	Inverters Single phase series resonant inverter Single phase bridge inverters Three phase bridge inverters Voltage control of inverters Harmonics reduction techniques Single phase and three phase current source inverters	1; 2 1; 2 1; 2 1; 2 1; 2 1; 2	8; 5 6; 5 6; 5 6; 5 6; 5 6; 5	353-358;267-276 227-236; 290-294 237; 248; 315-327 248-256&264-270;329-339 280-284;340-349 285-288; 349-362	1 1 1 2 1 1

Text Books:

1. M.H. Rashid, "Power Electronics: Circuits, Devices & Applications", Prentice Hall of India Ltd. 3rd Edition, 2004.
2. M.D. Singh and K.B. Khanchandani, "Power Electronics" Tata MC Graw Hill, 2005

Reference Books:

1. M.S. Jamil Asghar, "Power Electronics" Prentice Hall of India Ltd., 2004
2. A. Chakrabarti, Rai & Co. "Fundamentals of Power Electronics & Drives" Chanpat Rai & Co.
3. K. Hari Babu, "Power Electronics" Switch Publications.

TEE 604: Power Station Practice

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Unit No.	Topic Name	Text Books	Chapter Nos	Page Nos	No.of Lectures
1	Introduction: Electric energy demand and growth in India, electric energy sources.	1, 2	1, 1	1-6; 3-5	1
	Thermal Power Plant: Site selection, general layout and operation of plant, detailed description and use of different parts.	1,2	7,2	105-121; 6-10	4
	Hydro Electric Plants: Classifications, location and site selection, detailed description of various components, general layout and operation of Plants, brief description of impulse, reaction, Kaplan and Francis turbines, advantages & disadvantages, hydro-potential in India	1, 2	8, 3	126-147; 21-36	4
2	Nuclear Power Plant: Location, site selection, general layout and operation of plant. Brief description of different types of reactors Moderator material, fissile materials, control of nuclear reactors, disposal of nuclear waste material, shielding.	1,2	9,4	153,159-173; 39-50	3
	Gas Turbine Plant: Operational principle of gas turbine plant & its efficiency, fuels, open and closed-cycle plants, regeneration, inter-cooling and reheating, role and applications.	1,2	6, 6	96-104; 60-66	2
	Diesel Plants: Diesel plant layout, components & their functions, its performance, role and applications	1,2	6,5	90-95; 52-59	2
3	. Sub-stations Layout: Types of substations, bus-bar arrangements, typical layout of substation	1,2	13,1	259, 489-497	2
	Power Plant Economics and Tariffs: Load curve, load duration curve, different factors related to plants and consumers, Cost of electrical energy, depreciation, generation cost, effect of Load factor on unit cost. Fixed and operating cost of different plants, role of load diversity in power system economy. Objectives and forms of Tariff;. Causes and effects of low power factor, advantages of power factor improvement, different methods for power factor improvements.	1	2,3,4	17-32,40-50 56-62 62-75	5

4	Economic Operation of Power Systems: Characteristics of steam and hydro-plants, Constraints in operation, Economic load scheduling of thermal plants Neglecting and considering transmission Losses, Penalty factor, loss coefficients, Incremental transmission loss. Hydrothermal Scheduling	3	3	85-95 96-118 118-141	9
5	Non Conventional Energy Sources: Power Crisis, future energy demand, role of Private sectors in energy management, MHD generation: Working principle, open and closed cycles, MHD systems, advantages, parameters governing power output. Solar power plant: Conversion of solar heat to electricity, Solar energy collectors, Photovoltaic cell, power generation, future prospects of solar energy use. Wind Energy: Windmills, power output with combined operation of wind turbine generation and isolated generating system, technical choices& economic size. Geothermal Energy: Earth energy, heat extraction, vapor turbine cycle, difficulties & disadvantages, Tidal energy: Tidal phenomenon, tidal barrage, tidal power Schemes. Ocean Thermal Energy: Introduction, energy conversion, problems.	1	1,15	7-10 322-356	7

Text Books:

1. B.R. Gupta, "Generation of Electrical Energy", S. Chand Publication.
2. Soni, Gupta & Bhatnagar, "A text book on Power System Engg.", Dhanpat Rai & Co.
3. P.S.R. Murthy, "Operation and control of Power System" BS Publications, Hyderabad.

Reference Books:

1. W. D. Stevenson, "Elements of Power System Analysis", McGraw Hill.
2. S. L. Uppal, "Electrical Power", Khanna Publishers.

TCS:605 Object Oriented Systems and C++

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Unit No.	Topic Name	Text Book No.	Chapter No.	Nos. of Lectures
I	Object & classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract classes, Generalization, Multiple Inheritance, Meta data.	1	3,4	7
II	Events and States, Operations and Methods, Nested state diagrams, Concurrency, Relation of Object and Dynamic Models.	1	5	6

III	Functional Models, Data flow diagrams, Specifying Operations, Constraints, OMT Methodologies, examples and case studies to demonstrate methodology	1	6,7	7
IV	Principles of object oriented programming, Tokens, Expressions , classes, Functions, Constructors, Destructors, , Functions overloading, Operator Overloading, I/O Operations. Real life applications, Inheritance Extended Classes, Pointer. Virtual functions, Polymorphisms, Working with files, Class templates, Function templates,Exception handling, String manipulation. Translating object oriented design into implementations.	2	1 to 13 & 15	10
V	Introduction to Unix/Linux operating systems. Concept of file system, handling ordinary files,concept of shell, vi editor, Basic file attributes, concept of process, Basic system administration.	3	1,5 to 8, 10,13,17	10

Text Books:

1. Rambaugh James etal, "Object Oriented Design and Modeling",PHI-1997
2. Balagurusamy E," Object Oriented Programming with C++", TMH,2001 '
3. Sumitabha Das "Unix concepts & application" TMH

Reference Books:

1. Dillon and Lee, "Object Oriented Conceptual Modeling", New Delhi PHI-1993
2. Lipman, Stanley B, Jonsce Lajoie, .. C++ Primer Reading", AWL, 1999
3. Stephen R. Shah, "Introduction to Object Oriented Analysis and Design", TMH
4. Berzin Joseph, "Data Abstraction: the object oriented approach using C++", McGraw Hill
5. Budd, Timothy, "An Introduction to Object Oriented Programming", Pearson 2000

TEE-651: Power Electronics Laboratory

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Note: The minimum of 10 experiments is to be performed out of which at least three should be software based.

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without free wheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
6. To study single-phase ac voltage regulator with resistive and inductive loads.
7. To study single phase cyclo-converter
8. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
9. To study operation of IGBT/MOSFET chopper circuit
10. To study MOSFET/IGBT based single-phase series-resonant inverter.
11. To study MOSFET/IGBT based single-phase bridge inverter.

Software based experiments:

1. To obtain PSPICE simulation of SCR and GTO thyristor.
2. To obtain PSPICE simulation of Power Transistor and IGBT.
3. To obtain PSPICE simulation of single phase fully controlled bridge rectifier and draw load voltage and load current waveform for inductive load.
4. To obtain PSPICE simulation of single phase full wave ac voltage controller and draw load voltage and load current waveforms for inductive load.
5. To obtain PSPICE simulation of step down dc chopper with L-C output filter for inductive load and determine steady-state values of output voltage ripples in out put voltage and load current.

References:

1. M.H.Rashid, "Power Electronics: Circuits, Devices and Applications", 3rd Edition, prentice Hall of India.
2. D.W. Hart, "Introduction to power Electronics" prentice hall Inc. 1997.

TEE 652: Electrical Machine Design Laboratory:

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Note: Students should opt any two from the following:

1. Conventional and computer aided design of Three-phase transformer.
 2. Conventional and computer aided design of three phase induction motor
 3. Conventional and computer aided design of three phase synchronous machine
 4. Conventional and computer aided design of a dc shunt motor
- Students should design first by conventional method with respect to desired output performance. Later on, they should develop computer program and again with respect to desired output performance, design should be carried out and results should be compared.

TCS:655 Object Oriented Systems & C++ Lab

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1. Programs to demonstrate arithmetic , relational operators, pointers & I/O functions of C++
2. Programs to demonstrate
 - a. Constructors
 - b. Destructors
 - c. Inheritance
 - d. Polymorphism
 - e. Operator Overloading
 - f. Function overloading
3. Program to demonstrate
 - a.In-Line function
 - b.Virtual Function.
 - c. Friend functions
4. Programs to demonstrate File operations in C++
5. Programs to demonstrate unix commands

U.P. TECHNICAL UNIVERSITY

LUCKNOW



Revised

Syllabus

of

B.Tech. Electrical Engineering

3rd yr. (V & VI Semester)

(Effective from session 2006-07)