

BE VIII SEMESTER						
COURSE CONTENTS						
EE-8201	H.V. Engineering	L	T	P	Max. Marks	Min. Marks
Duration in hrs.		3	0	0	70	22

Course Objective:

UNIT – I :Insulation in power system:

General characteristics of gases, liquid and solid insulators. Mechanism of break down of gases, basic process of ionization in a gas. Discharge in uniform field. Townsend's and streamer theory, paschen's law, discharge in non uniform field, effect of polarity, effect of wave shape of impressed voltage on the breakdown strength, time of discharge, corona discharge on the conductor of transmission line. Mechanism of breakdown in liquids, suspended particle, suspended water and cavitations breakdown. Mechanism of breakdown in solids: intrinsic and electromechanical, breakdown due to treeing and tracking, thermal breakdown. Electrochemical breakdown.

UNIT – II :Production and measurement of high voltage:

methods of production of power frequency high voltage: cascade transformers and resonance methods. Generation of high voltage D.C., voltage stabilization tesla coil. Principal of generation of impulse voltage. Standard impulse voltage. Analysis and control of simple circuit of impulse generators, various methods for measurement of high voltage A.C., D.C. and impulse voltage.

UNIT – III :Testing:

Objectives and methods at preventive testing of insulation, measurement of insulation resistance of cables, measurement of $\tan\delta$ and high voltage capacitance as a method of preventive testing, high voltage Schering bridges of insulation. Measurement of breakdown strength of transformer oil. Partial discharge in an insulation and method of its detection, preventive testing of line substation, transformers and cables.

UNIT – IV :Over voltages and insulation coordination:

over voltages in transmission system. Lightning, switching and temporary over voltages. Traveling waves on transmission systems, their shape, attenuation and distortion, effect of junction and termination of propagation of traveling waves, basic impulse insulation level (BIL) and its selection and significance, Control of lightning and switching over voltages. Basic principle of lightning arrestors. Characteristics of lightning arrestors, selection of arrestor rating: coordination of protective device with apparatus insulation.

UNIT – V :EHV AC & DC transmission:

Constitution of EHV A.C. & D.C. links, kinds of D.C. links, limitation and advantages of A.C. and D.C. transmission. Trends in EHV AC and DC Transmission, surge impedance and surge impedance loading, voltage profile of loaded and unloaded extra long distance line along the line. Power handling capacity of lines, series and shunt compensation of extra long distance lines. Tuned power lines, problems of extra long, compensated lines. FACT devices concept and applications, principle applications of A.C. and D.C. transmission.

References-

1. C.L. Wadhwa, High voltage engineering New age international publishers.
2. L.V. Bewley's traveling waves on transmission system, Wiley Newyork.
3. Begmudre EHV AC transmission.
4. Kimbark, HVDC transmission.
5. S. Rao, EHV AC & DC transmission.
6. Arrilaga HVDC transmission
7. Podiyar, HVDC transmission.

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BE VIII SEMESTER						
COURSE CONTENTS						
EE-8204	Utilization of Electrical Power	L	T	P	Max. Marks	Min. Marks
Duration in hrs.		3	0	0	70	22

Course Objective:

UNIT - I

Illumination Engineering: Nature of light, units, sensitivity of the eye, luminous efficiency, glare. Production of Light; Incandescent lamps, arc lamps gas discharge lamps- fluorescent lamps-polar curves, effect of voltage variation on efficiency and life of lamps, Distribution and control of light, lighting calculations, solid angle, inverse square and cosine laws, methods of calculations, factory lighting, flood lighting and street lighting, Direct diffused and mixed reflection & transmission factor, refractors, light fittings. LED light, Sodium Vapour lamp & CFL.

UNIT - II

Heating, Welding and Storage Devices: Electrical heating-advantages, methods and applications, resistance heating, design of heating elements, efficiency and losses control. Induction heating: core type furnaces, core less furnaces and high frequency eddy current heating, dielectric heating: principle and special applications, arc furnaces: direct arc furnaces, Indirect arc furnaces, electrodes, design of heating elements, power supply and control. Different methods of electrical welding, resistance welding, arc welding, energy storage welding, laser welding, electro beam welding, and electrical equipment for them. Arc furnaces transformer and welding transformers. Storage devices, dry and wet batteries, battery charging circuits.

UNIT - III

Traction: Special features of Traction motors, Different system of electric traction and their Advantages and disadvantages, diesel electric locomotives. Mechanics of train movement: simplified speed time curves for different services, average and schedule speed, tractive effort, specific energy consumption, factors affecting specific energy consumption, acceleration and braking retardation, adhesive weight and coefficient of adhesion.

UNIT - IV

Traction Motors: DC motors, single phases and three phases motors, starting and control of traction motors, braking of traction motors: plugging, rheostatic and regenerative braking, Modern 25 KV A.C. single phase traction systems: advantages, equipment and layout of 25 KV, line and current selection, single phase power frequency A.C. traction.

UNIT - V

Electric Drive Applications: Individual and collective drives- electrical braking, plugging, rheostatic and regenerative braking load equalization use of fly wheel criteria for selection of motors for various industrial drives, calculation of electrical loads for refrigeration and air-conditioning, intermittent loading and temperature rise curve.

Reference Books:

1. Garg, G.C., Utilization of Elect. Power and Elect. Traction.
2. N V Suryanarayan, Utilization of Elect. Power including Electric Drives and Elect. Traction, New Age International.
3. Hancock N N, Electric Power Utilization, Wheeler Pub.

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BE VIII SEMESTER						
COURSE CONTENTS						
EE-8205	Wind and Solar Energy System	L	T	P	Max. Marks	Min. Marks
Duration in hrs.		3	0	0	70	22

Course Objective:

UNIT – I :

Sources of Energy: Renewable energy sources and features. Introduction to wind and solar energy.

UNIT – II :

Wind Energy: General theories of wind machines: Basic laws and concept of aerodynamics, efficiency limit for wind energy conversion. Description and performances of horizontal axis wind turbine: Design of the blades and determination of forces acting on the wind power plant, power ~ speed and torque ~ speed characteristics of wind turbines, wind turbine control systems. Description and performances of vertical axis wind turbine.

UNIT – III :

Conversion to electrical power: Induction and synchronous generators, grid connected and self-excited induction generator operation, generation schemes with variable speed turbines, constant voltage and constant frequency generation with power electronic control, Optimized control of induction generators and synchronous generators.

UNIT – IV :

Solar Photovoltaic systems: Operating principle, photovoltaic cell concepts, cell, module, array, series and parallel connections. Basics of Batteries: Types and parameters of batteries for PV systems, series and parallel connections and performance characteristics.

UNIT – V :

Solar PV system design, charge controllers, MPPT techniques. Hybrid Systems: Need for hybrid systems, types and issues with hybrid systems, Grid integration of wind and PV systems.

References-

1. S. N. Bhadra, D. Kastha, S. Banerjee, *Wind Electrical Systems*, Oxford Univ. Press , 2005
2. C.S. Solanki, *Solar Photovoltaics Fundamentals, Technologies and Applications*, PHI Learning Pvt. Ltd. , 2016

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BE VIII SEMESTER						
COURSE CONTENTS						
EE-8203	Computer Aided Power System	L	T	P	Max. Marks	Min. Marks
Duration in hrs.		3	0	0	70	22

Unit - I

Models of power system components, network model using graph theory, formation of Z bus, transmission line models, regulating transformer, line load ability, capability curves of alternator.

Unit - II

Control of load bus voltage using reactive power control variable, SVC & SVS, Regulated shunt compensation, series and shunt compensation, Uniform series and shunt compensation and effect on loadability of transmission lines.

Unit - III

Sensitivity analysis- General sensitivity relations, generation shift distribution factors, line outage distribution factors, compensated shift factors, sensitivity associated with voltage-VAR, sensitivities relating load bus voltage changes in terms of PV bus voltage changes, sensitivity relating changes in reactive power generation for changes in PV Bus Voltage.

Unit - IV

Power system security – Security functions, Security level, contingency analysis, security control, economic dispatch using LP formulation, pre-contingency and post- contingency, corrective rescheduling.

Unit - V

Voltage stability - Difference between voltage and angle stability, PV Curve for voltage stability assessment, proximity and mechanism, modal analysis using reduced Jacobian, participation factor, effect of series and shunt compensation on voltage stability , effect of load models.

References:

1. Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc.1984.
2. Computer methods in power systems analysis – by stage G.W. and E.L. Abiad A.H. Mc Graw Hill.
3. Computer Techniques in Power Systems Analysis- Pai M.A. Tata Mc Graw Hill.
4. Computer Modelling of Electrical Power Systems, Arrillaga J. Amord C.P Harker B.J. John Wiley & Son
5. Computer Aided Power Systems Analysis Kusic G.L.- 2nd Edition, CRC Press
6. Modern Power Systems Analysis Nagrath I.J. and Kothari D.P. Tata Mc Graw Hill.
7. Power System Analysis Grainger J.J. & Stevnson W.D. Mc Graw Hill.
8. Power System Stability and control –P Kundur , IEEE Press 1994.
9. Advance Power Systems Analysis and Dynamics Singh L.P. John W