COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	Higher Engineering Mathematics	MA-103	Min "D"	Min "D"	5.0

HIGHER ENGINEERING MATHEMATICS

UNIT -I

Solution of Partial Differential Equation (PDE), by separation of variable method, numerical solution of PDE (Laplace , Poisson's, Parabola) using finite difference methods, Elementary properties of FT, DFT, WFT, Wavelet transform, Haar transform.

UNIT -II

Probability, compound probability and discrete random variable. Binomial, Normal and Poisson's distribution, Sampling distribution, elementary concept of estimation and Theory of hypothesis, recurred relations.

UNIT -III

Stochastic process, Markov process, transition probability, transition probability matrix, just and higher order Markov process, Markov chain, Queuing system, transient and steady state, traffic intensity, distribution queuing system, concepts of Queuing models (M/M/1: Infinity/Infinity/FC FS), (M/M/S: Infinity/ Infinity/FC FS)

UNIT -IV

Operation of fuzzy sets, fuzzy arithmetic & relations, fuzzy relation equations , fuzzy logics. Artificial neural network and its application.

UNIT - V

Introduction and definition of reliability, derivation of reliability function, failure rate, hazard rate, mean time future & their relation, concept of fault tolerant analysis, elementary idea about decision theory and goal programming.

References :

1. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
2. Advance Engineering Mathematics by Ervin Kresvig, Wiley Easten Edd.
3. Applied Numerical Methods with MATLAB by Steven C.Chapra, TMH.
4. Introductory Methods of Numerical Analysis by S.S.Shastry,
5. Introduction of Numerical Analysis by Forberg.
6. Numerical Solution of Differential Equation by M.K.Jain
7. Numerical Mathematical Analysis by James B. Scarborogh
8. Fourier Transforms by J.N.Sheddon
9. Fuzzy Logic in Engineering by T.J.Ross
10. Fuzzy Sets Theory & its Applications by H.J.Zimmersoms.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	OVER VOLTAGES IN POWER SYSTEM	**EE-107**	Min "D"	Min "D"	5.0

OVER VOLTAGES IN POWER SYSTEM

UNIT - I

LIGHTNING DISCHARGE AS A SOURCE OF ATMOSPHEREIC OVER VOLTAGES

General information, parameters of lightning discharge, theoretical form of lightning current wave, electro-magnetic field of lightning canal, intensity of lightening activity.

UNIT- II : TRANSIENT PHENOMENA IN TRANSMISSION LINES

General information, propagation of waves in a multi-conductor system, multiple reflection of waves, action of waves on an oscillatory contour, action of waves of any form on simple circuits, method of section of tangents, effect of impulse corona on transient phenomenon, natural oscillation of a section of a line.

UNIT – III : NEUTRAL GROUNDING & ISOLATED NEUTRAL

Neutral grounding in electrical power system, Transient phenomena at the moment of short – circuit to ground, voltage rise during repeated re-strikings of the arc, extinction of capacitive current of ground fault with the aid of arc-extinction apparatus, displacement of neutral in the circuits having arc-extinction apparatus, construction of arc-extinction apparatus and choice of their rating.

UNIT – IV : OVER VOLTAGE

Over-voltages during disconnection of open lines and batteries of condensers. Over-voltages during the opening of inductances. Resonance over-voltages. General information, resonance over-voltages in linear circuits, harmonic resonance, over-voltages during unequal polo breaking, sub-harmonic resonance.

UNIT – V : INTERNAL OVERVOLTAGE IN LONG DISTANCE TRANSMISSION

General information, schemes of long distance transmission and operating conditions loading to over-voltages, basic parameters of lines, model of long lines for the investigation of internal over-voltages, steady-stage voltages rise in simplest schemes without the consideration of magnetic shunt of the transformer, effects of magnetization current of the transformer (Magnetic shunt) on the over-voltages in the simplest schemes, effects of the shunt compensating reactors on steady-state over-voltages.

References :

1. High Voltage Engineering by Prof. D.V. Razevig

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	POWER SYSTEMS OPERATION AND CONTROL	EE-108	Min "D"	Min "D"	5.0

POWER SYSTEMS OPERATION AND CONTROL

UNIT - I : CONTROL CENTER OPERATION OF POWER SYSTEM

Introduction to SCADA, control center, digital computer configuration, automatic generation control, area control error, operation without central computers, expression for tie line flow and frequency deviation, parallel operation of generators, area lumped dynamic model.

UNIT II : AUTOMATIC GENERATION CONTROL

Automatic voltage regulator, automatic load frequency control, VAR control, loops of generators, performance of AVR, ALFC of single area systems, concepts of control area, multi area systems, POOL operation – two area systems, tie line bias control.

UNIT - III : CONTROL OF VOLTAGE AND REACTIVE POWER

Introduction, generation and absorption of reactive power, relation between voltage, power and reactive power at a node, single machine infinite bus system, method of voltage control, sub synchronous resonance, voltage stability, voltage collapse.

UNIT - IV : POWER SYSTEM OPTIMIZATION

Optimal system operation with thermal plants, incremental production costs for steam power plants, constraints in economic operation, flow charts, transmission loss as a function of plant generation, the B – coefficients.

UNIT - V : UNIT COMMITMENT

Statement of the problem, need and importance of unit commitment, methods – priority list method, dynamic programming method, constraints, spinning reserve

UNIT - VI : POWER SYSTEM SECURITY

Introduction, factors affecting power system security, power system contingency analysis, detection of network problems, network sensitivity methods, calculation of network sensitivity factor, contingency ranking.

References :

1. Computer aided power system analysis by G L Kusic,
2. Modern power system analysis by I J Nagrath and D P Kothari,
3. Power generation, operation & control by A J Wood and B F Wappemberg,
4. Edmund Real Time control of power system by Ed Hardschin,
5. Power system dynamics, stability & control by K R Padiyar,
6. Power system stability and control by Prabha Kundur,

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	SWITCH GEAR & PROTECTION RELAYS	EE-109	Min "D"	Min "D"	5.0

SWITCH GEAR & PROTECTION RELAYS

UNIT – I : ARC EXTINCTION : Deionization and growth of dielectric strength, Displacement versus diffusion theory of arc interruption, study of current- zero phenomena and relation to the rate of decrease of conductance of arc path. Residual conductance. Effect of power on the arcing period. Calculation of arc energy. Mechanism of arc interruption in oil, air, gas energy balance theory.

UNIT – II : CIRCUIT SEVERITY : Recognition of the arc, arc voltage, re-striking conditions, effects of resistance, capacitance and inductance. Calculation of electric transient recovery voltage, its frequency and rate of rise, effect of asymmetry, distortion of current wave and recovery voltage current chopping – Resistanceswitching. Circuit breaker opening and closing mechanisms. Relationship between contact resistance and temperature, contact resistance , pressure, heating, heat dissipation, electromagnetic forces. Voltage distribution in multi break circuit breakers, comparison of performance of various types of circuit breakers, their rating and selection, testing of circuit breakers, testing standards and methods

UNIT – III : PROTECTIVE RELAYING: Purpose of protective relaying, definition, construction and design considerations of relays, characteristic, choice of measuring units, their construction and design considerations. Measuring units and timing units.

UNIT – IV : MAIN CHARACTERISTICS OF PROTECTIVE RELAYS Phase and amplitude comparators, relays characteristics general equation for characteristics.

Over current protection : Time current characteristics applications directional over current protection, AC tripping scheme for radial feeders

Distance relay : General principles, special characteristics, limitation, application to lines, settimd construction of distance relays, zero-sequence current compensation.

UNIT – V : DIRECTIONAL PILOT RELAYING : Basic principles, pilot-wire schemes carrier channel schemes, carrier signal schemes, carrier signal checking, future trends.

A.C. PILOT RELAYING : Pilot wire scheme, phased/and amplitude comparators, effect of load current Multi-terminal lines pilot wire limitations, pilot supervision phase comparison carrier, protection of A C generator and transformers, types of faults differential protection special problems in transformer, negative sequence and field protection of generators, Gas relay for transformers, Earth fault protection.

BUSZONE PROTECTION : General principles, Current differential protection frame leakage protection.

References :

1. Art and Science of Protective Relaying by CR Mason
2. Protective Relays-Their Theory and Practice by A.R. Van C Warrington
3. Relay Systems by Moseth and Robinson L
4. Protective Gear Hand Book. by S.Kaufwan

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	GENERATION & MEASUREMENT OF HIGH VOLTAGE	EE-110	Min "D"	Min "D"	5.0

GENERATION & MEASUREMENT OF HIGH VOLTAGE

UNIT – I: Review of conduction and B.D. phenomena in dielectrics:- Mechanism of breakdown gases, liquid and solid dielectrics, corona discharge and breakdown in non uniform fields, vacuum insulation.

UNIT – II: Generation and Measurement of high D.C. voltages:- Half wave rectifier circuit, voltage double circuit, Cockloft – Walton voltage multiplier circuit, van-de graft generator. Series resistance micro ammeter, resistance potential divider, generating voltmeter, spheres and other spark gaps.

UNIT – III : Generation and measurement of high a.c. voltages . cascaded transformers, power supply. Power supply for a.c. test circuit, Resonant transformers, generation of high frequency a.c. high voltages. Series impedance ammeter, potential dividers (resistance and capacitor type) potential transformer (electromagnetic and cvt), electrostatics voltmeter, sphere gaps

UNIT – IV: Generation & Measurement of Impulse Voltages. Standard impulse voltage work charge, Theoretical representation of impulse waves, Circuits for producing impulse waves, Multistage impulse generators- Marx circuit, Components of multistage impulse generator, Generation of switching surges, Tripping and control of impulse generators. Capacitance potential dividers and capacitance voltage transformers, Potential transformers (Magnetic Type), Electrostatic voltmeters, Peak Reading a.c. voltmeters, Spark gaps for measurement of high d.c, a.c. and impulse voltages (Peak value), Potential dividers for impulse voltage measurements, Peak reading voltmeters for impulse voltages

UNIT - V : H.V. Testing of Electrical Apparatus:-Introduction, measurement of direct current resistivity, measurement of dielectric constant and loss factor, partial discharge measurements. Testing of insulators and bushings, testing of Isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements.

References :

1. High Voltage Engineering fundamental by E. Kuffel, W S Zaengl,
2. High Voltage by M S Naidu and V Kamaraju,
3. High Voltage Engineering by C L Wadhwa,
4. High Voltage Measurement Techniques by Schwab A
5. High Voltage Laboratory Planning by Haylten – Cavallins N
6. An introduction to High Voltage experimental techniques by Dieter K
7. Extra High Voltage AC Transmission Engg by R K Begamudre
8. Transmission and Distribution Reference Book – Westing House.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	H.V. ENGINEERING LAB – I	EE-111L	Min "D"	Min "D"	5.0

The exercises in this component shall be designed to demonstrate the basic principles outlined in different units of the theory paper. After completing the exercises the student should have developed a good grasp of the practical utilities of the theory content.

(Suggested Exercise)

1. Find out standard Impulse wave 1.2/50 rpm using impulse generator.
2. Impulse testing of power transformer.
3. Impulse testing of cables.
4. To determine the breakdown voltage of sphere, sphere gap.
5. To determine the breakdown voltage of rod-rod gap.
6. To determine the breakdown voltage of Needle-Needle gap.
7. To determine the breakdown voltage of Needle Plane gap.
8. To determine the breakdown voltage of transformer oil.
9. To find out string efficiency.
10. To find out AC Corona losses.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Branch	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
	H.V. ENGINEERING LAB – II	EE-112L	Min "D"	Min "D"	5.0

The exercises in this component shall be designed to demonstrate the basic principles outlined in different units of the theory paper. After completing the exercises the student should have developed a good grasp of the practical utilities of the theory content.

(Suggested Exercise)

1. Measurement of capacitance /hand of bushings.
2. Measurement of partial discharge in given sample.
3. To find out the particle in the transformer oil and its effect on break down voltage of transformer oil.
4. Calibration of relay.
5. Calibration of energy meter.
6. Partial discharge measurement by Acoustic measurement system.
7. Find out the break down voltage using D.C. source in air and oil.
8. Find out current rating of a fuse & other equipment.
9. Insulation breakdown strength of 11KV transformer winding by power frequency voltage source.
10. Study of D.G. Analyzer.