Shri Vaishnav Vidyapeeth Vishwavidyalaya
Master of Technology (Power System)
SEMESTER I

Common for Power System / Power Electronics

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTPS 101		COMPUTER APPLICATIONS IN POWER SYSTEM	2	1	2	4	60	20	20	30	20

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives: The Students will be able to
1. learn essential optimization techniques for applying to day to day problems.
2. impart the load flow solution methodology
3. assessment methods of power system dynamics.
4. They will be familiar with the method to evaluate power system economic operation and optimal power flow analysis.

Course Outcomes:
After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes
The students will be able to
1. To recognize the main computer-methods in power system dynamics.
2. To apply optimization techniques to engineering and other problems.
3. To understand the fundamentals of the linear and non-linear programming problem.
4. To demonstrate the computer-procedures for economic load dispatch operation and optimal load flow analysis of power system networks using Newton-Raphson iterative methods.
5. To develop ability to solve real problems of an existing power system using the computer.
6. To perform contingency analysis for power system networks

Syllabus:

UNIT-I
Optimization Techniques
Introduction, Statement of an optimization problem, design vector, design constraints, constraint surface, objective function, classification of optimization problem. Classical optimization Techniques, single variable optimization, multivariable optimization with equality constraints, Direct substitution method, constrained variation method, Lagrange Multiplier method, formulation of multivariable optimization, Kunh Tucker conditions.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Power System)

SEMESTER I

UNIT -II

Optimization Techniques

Nonlinear Programming, Unconstrained optimization Techniques, Direct search methods, Indirect search methods, Descent methods, One dimensional minimization methods, unimodal function, elimination methods.

UNIT -III

Load Flow Studies

Revision of Load flow studies by using Newton Raphson method (polar and rectangular). Contingency evaluation, concept of security monitoring, Techniques of contingency evaluation, Decoupled load flow and fast decoupled load flow.

UNIT -IV

Three Phase Load Flow: Three phase load flow problem notation, specified variables, derivationof equations.**AC-DC load flow:** Introduction, formulation of problem, D.C. System model, convertervariables, Derivation of equations, Inverter operation, generalized flow chart for equation solution.

UNIT -V

Optimal Power Flow Analysis

Optimal power flow analysis considering equality and inequality constraints. Economic dispatch with and without limits (Classical method) Gradient method.

Optimal Power System Operation: Calculation of loss coefficients, loss coefficients using sensitivity factors, power loss in a line, Generation shift distribution factors, Transmission loss coefficients, transmission loss formula as a function of generation and loads, economic dispatch using loss formula which is function of real and reactive power, linear programming method.

Reference Books

1. Computer Aided Power System Operation and Analysis-R.N.Dhar, Tata McGraw Hill New Delhi.
2. Computer Techniques in Power System Analysis- M.A. Pai, Tata Mc-Graw Hill New Delhi.
3. Computer Methods in Power System Analysis- Stagg and El.Abiad, Mc-Graw Hill (International Student Edition.)
4. Computer Analysis of Power Systems-J.Arrilinga, C.P.Arnold. Wiely Eastern Ltd.
5. Optimisation Techniques-S.S.Rao, Wiely Eastern Ltd, New Delhi.
6. Modern Power System Engineering, Nagrath and Kothari (Tata McGraw Hill)
7. Power System Optimisation- D. P. Kothari, J. S. Dhillon, PHI.
8. Power Generation Operation and Control – Allen Wood, Wiley Publications.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Power System)

SEMESTER I

List of Practical's:

1. Load flow analysis by using Newton Raphson method on digital computer.
2. Optimal Power flow analysis.
3. AC-DC load flow analysis on digital computer.
4. Analysis of various types of faults on digital computer.
5. Short circuit analysis.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Power System)

SEMESTER I

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTPS 102		ADVANCED POWER ELECTRONICS	2	1	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
The Students will be able to gain knowledge of advanced power converters like Matrix Converters, Multilevel Inverters etc and their applications and usage for energy efficiency.

Course Outcomes:
After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes
The students will be able to

1. Describe different converters.
2. Apply the skill in designing the converters.
3. Gain ability to understand the role of converters in the improvement of energy usage efficiency.
4. Simulate the power converter circuits using MATLAB and observe the waveforms

Syllabus:

UNIT -I
Voltage Source Converters :
Review of 3-ph- full wave bridge converter, operation and harmonics, 3 level voltage source converters. PWM converter. Generalised technique of harmonic elimination and voltage control. Advanced modulation techniques (space vector modulation, 3 harmonic PWM) Comparison of PWM techniques. Converter rating.

UNIT -II
Matrix Converter: 3×3 matrix converter, principal of working, mathematical treatment, comparison of matrix converter with multi pulse converter.
Self and Line commutated current source converter: Basic concepts of CSC, converters with self commutating devices. Comparison with voltage source converter.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Master of Technology (Power System)
SEMESTER I

UNIT -III
Multilevel Inverters:
Multilevel concept, Types of multilevel Inverters, diode clamped multilevel inverter, flying-capacitors multilevel inverters, cascaded multilevel inverter, switching device currents,DC link capacitor voltage balancing, features of multilevel inverters, comparison of multilevel converters.

UNIT -IV
Fundamental and harmonic voltages for a 3 level converter, 3 level converter with parallel legs, generalized techniques of harmonic elimination and voltage control.
Applications of multilevel Inverter:
Reactive power compensation Back to back intertie system, Utility compatible adjustable speed drives.

UNIT -V
Energy Storage Systems:
Flywheel energy storage system, superconducting magnetic energy storage system, other energy storage systems.
Akagi's p-q theory:
Conventional concepts of active and reactive power in single phase and three phase circuits-Equation of power with sinusoidal voltage source and non-linear loads - αβo transformation of three phase four wire system- Akagi's instantaneous power (pq) theory- relationship between Akagi's components and conventional active and reactive power application of pq theory to reactive and harmonic power compensation in simple circuits.

Reference Books

1. Power Electronic Control in Electrical Systems by E.Acha, Miller & Others (Newnes, Oxford publication) – first Edition
2. Power Electronics by M. H. Rashid Prentice Hall of India Pvt. Ltd. New Delhi, (3rd Edition).
3. Understanding FACTS by N.G. Hingorani & L.Gyugyi (IEEE Press, Indian Edition) .
4. H. Akagi, E.H. Watanabe and M.Aredes "Instantaneous Power Theory and Applications to Power Conditioning, IEEE Press , New York.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Power System)

SEMESTER I

Common for Power System / Power Electronics

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTPS 113		**FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS**	2	0	0	2	60	20	20	0	0

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
To enable the students acquire a comprehensive knowledge on the concepts and technology of flexible AC transmission systems.

Course Outcomes:
After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The students will be able to

1. Apply knowledge of FACTS controller to AC transmission system
2. Apply shunt, series and their combination for compensation.
3. Identify, formulate and solve network problems with FACTS controller.
4. Familiarize application & control strategies of FACTS controllers to improve power transmission capability.

Syllabus:

UNIT I
FACTS Concept and General System Considerations, Power Flow in AC System, Definitions on FACTS, Basic Types of FACTS Controllers. Converters for Static Compensation, Three Phase Converters and Standard Modulation Strategies (Programmed Harmonic Elimination and SPWM), GTO Inverters, Multi -Pulse Converters and Interface Magnetics,

UNIT II
Transformer Connections for 12 , 24 and 48 pulse operation, Multi -Level Inverters of Diode Clamped Type and Flying Capacitor Type and suitable modulation strategies (includes SVM), Multi -level inverters of Cascade Type and their modulation, Current Control of Inverters

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Unit III

Static Shunt Compensators, SVC and STATCOM, Operation and Control of TSC, TCR, STATCOM, Compensator Control, Comparison between SVC and STATCOM, STATCOM for transient and dynamic stability enhancement

UNIT IV

Static Series Compensation, GCSC, TSSC, TCSC and SSSC, Operation and Control, External System Control for Series Compensators, SSR and its damping, Static Voltage and Phase Angle Regulators, TCVR and TCPAR, Operation and Control

UNIT V

UPFC and IPFC, The Unified Power Flow Controller, Operation, Comparison with other FACTS devices, control of P and Q, Dynamic Performance, Special Purpose FACTS Controllers, Interline Power Flow Controller, Operation and Control.

Text Books:

1. N.G . Hingorani & L. Gyugyi : Understanding FACTS: Concepts and Technology of Flexible AC
2. Transmission Systems. IEEE Press, 2000.
3. T.J.E Miller, Reactive Power Control in Electric Systems John Wiley & Sons
4. Ned Mohan et.al: Power Electronics.John Wiley and Sons.
5. 'FACTS Controllers and applications" course book for STTP, 2003, Dr Ashok S & K S Suresh kumar

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Power System)

SEMESTER I

<table>
<tr><th rowspan="3">COURSE CODE</th><th rowspan="3">CATEGORY</th><th rowspan="3">COURSE NAME</th><th rowspan="3">L</th><th rowspan="3">T</th><th rowspan="3">P</th><th rowspan="3">CREDITS</th><th colspan="5">TEACHING & EVALUATION SCHEME</th></tr>
<tr><th colspan="3">THEORY</th><th colspan="2">PRACTICAL</th></tr>
<tr><th>END SEM University Exam</th><th>Two Term Exam</th><th>Teachers Assessment*</th><th>END SEM University Exam</th><th>Teachers Assessment*</th></tr>
<tr><td>MTPS 123</td><td></td><td>POWER SYSTEM DYNAMICS</td><td>2</td><td>0</td><td>0</td><td>2</td><td>60</td><td>20</td><td>20</td><td>0</td><td>0</td></tr>
</table>

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

The Students

1. Will Be Able to familiarize with different models of machines
2. with emphasis on their analysis and application to practical engineering problems
3. efficiently & effectively
4. analysis and comparison of angle and voltage stability

Course Outcomes:

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

The students will be able to

1. To impart knowledge on dynamic modeling of a synchronous machine in detail.
2. To describe the modeling of excitation and speed governing system in detail.
3. To understand the fundamental concepts of stability of dynamic systems and its classification.
4. To understand and enhance small signal stability problem of power systems.

Syllabus:

UNIT I

Review of Classical Methods

System model, states of operation and system security, steady state stability, transient stability, simple representation of excitation control.

UNIT II

Dynamics of Synchronous Generator Connected to Infinite Bus

System model, simplified synchronous machine model, calculation of Initial conditions, system simulation, improved model of synchronous machine, inclusion of SVC model.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Master of Technology (Power System)
SEMESTER I

UNIT III
Analysis of Single Machine
Small signal analysis, applications of Routh-Hurwitz criterion, analysis of synchronizing and damping torque, state equation for small signal model

UNIT IV
Power System Stabilizers
Basic concepts of control signals in PSS, structure and tuning, field implementation, PSS design and application, future trends.
a) Voltage Stability:
Definition, factors affecting voltage instability and collapse, analysis and comparison of angle and voltage stability, analysis and comparison voltage instability and collapse, control of voltage instability.
b) Islanding: Necessity for islanding, methods, use, advantages and disadvantages, implication on power system dynamic performance.

UNIT V
Multi-machine System
Simplified model, Improved model of the system for linear load, Inclusion of dynamics of load and SVC, introduction to analysis of large power system.

Text Books:
1. Power System Dynamics- K.R. Padiyar, B.S. Publications
2. Power System Dynamics Control – Prabha S. Kundur, IEEE Press, New York
3. Power System Stability – E.W. Kimbark, IEEE press, N.Y, Vol.
4. Power System Voltage Stability – C. W. Taylor., McGraw Hill International student edition.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Power System)

SEMESTER I

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTPS133		**POWER SYSTEM ECONOMICS AND MANAGEMENT**	2	0	0	2	60	20	20	0	0

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

The Students

1. will be able to characterize existing electric industry structure and market systems
2. determine electricity and transmission prices
3. how they affect the transmission expansion of electric power systems
4. be conversant with transmission and resource planning tools and procedures used by today's industry.

Course Outcomes:

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

The students will be able to

1. Demonstrate the methods of economic regulation in India.
2. Impart optimal power system expansion and its planning
3. Adopt appropriate rules for load and electricity price forecasting
4. Apply appropriate transmission pricing schemes in open access transmission systems

Syllabus:

UNIT -I

Power Sector in India

Introduction to various institutions in Indian Power sector such as CEA, Planning Commissions, PGCIL, PFC, Ministry of Power, state and central governments, REC, utilities and their roles. Critical issues / challenges before the Indian power sector, Salient features of Electricity act 2003, Various national policies and guidelines under this act. Need of regulation and deregulation of power industry. Conditions favouring deregulation in power sector.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Master of Technology (Power System)
SEMESTER I

UNIT -II

Power sector economics and regulation

Typical cost components and cost structure of the power sector, Different methods of comparing investment options, Concept of life cycle cost , annual rate of return , methods of calculations of Internal Rate of Return(IRR) and Net Present Value(NPV) of project, Short term and long term marginal costs, Different financing options for the power sector . Different stakeholders in the power sector, Role of regulation and evolution of regulatory commission in India, types and methods of economic regulation, regulatory process in India.

UNIT -III

Power Tariff

Different tariff principles (marginal cost, cost to serve, average cost), Consumer tariff structures and considerations, different consumer categories, telescopic tariff, fixed and variable charges, time of day, interruptible tariff, different tariff based penalties and incentives etc., Subsidy and cross subsidy, life line tariff, Comparison of different tariff structures for different load patterns. Government policies in force from time to time. Effect of renewable energy and captive power generation on tariff. Determination of tariff for renewable energy. Non price issues in electricity restructuring, quality of supply and service, standards of performance by utility, environmental and social considerations.

UNIT -IV

Power sector restructuring and market reform

Different industry structures and ownership and management models for generation, transmission and distribution. Competition in the electricity sector- conditions, barriers, different types, benefits and challenges Latest reforms and amendments. Different market and trading models / arrangements, open access, key market entities- ISO, Genco, Transco, Disco, Retail co, Power market types, Energy market, Ancillary service market, transmission market, Forward and real time markets, market power and exercising it and its effect on market operations

UNIT -V

Transmission Planning and pricing

Transmission planning, Different methods of transmission pricing, Different transmission services, Congestion issues and management, Transmission cost allocation methods, Locational marginal price, firm transmission right. Transmission ownership and control, Transmission pricing model in India, Availability based tariff, role of load dispatch centers (LDCs), concept of arbitrage in Electricity markets, game theory methods in Power System, security constrained unit commitment. Ancillary services for restructuring, Forward ancillary service auction. Power purchase agreements.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Power System)

SEMESTER I

Reference Books:

1. Fundamentals of Power System Economics by D.S. Kirschen and G. Strbac, John Wiley & sons.
2. Electricity Economics Regulation and Deregulation, by G. Rothwell and T Gómez, Wiley – Inter Science
3. Sally Hunt, "Making Competition Work in Electricity", 2002, John Wiley Inc
4. Electric Utility Planning and Regulation, Edward Kahn, American Council for Energy Efficient Economy
5. Know Your Power", A citizens Primer On the Electricity Sector, Prayas Energy Group, Pune.
6. Power System Economics Designing markets for Electricity by Steven Stoft , Wiley- inter Science.
7. Market Operations in Electric Power Systems, Forecasting, Scheduling and Risk Management, by M. Shahidepour, Hatim yamin, Zuyi Li, Wiley Inter Science
8. Deregulation in Power Industry, hand outs of CEP conducted by S.A. Khapard.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Power System)

SEMESTER I

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTPS114		**POWER SYSTEM RELIABILITY**	2	0	0	2	60	20	20	0	0

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

The Students

1. Will be able to Evaluation of generation, transmission and distribution system reliability and their impacts on system planning
2. it will address the factors affecting power system expansion planning, operation
3. decision making and other management issues
4. Reliability indices and main results such as interruptions and societal impact.

Course Outcomes:

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

The students will be able to

1. The student shall have a thorough understanding of the main principles in power system reliability analysis as well as knowledge of different methods and tools for reliability analysis
2. To introduces the objectives of Load forecasting.
3. To perform reliability analysis of Generators and transmission systems models through analytical ways.
4. General approach to computation of system reliability, Computer methods of analysis.

Syllabus:

UNIT I

Basic Reliability Concepts:

Combinatorial reliability - series, parallel and series-parallel configuration: Multi-state models, Stand-by system models, Catastrophic failure models – Treatment of failure data. Reliability in terms of hazards rate and failure density. Different hazard methods.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Master of Technology (Power System)
SEMESTER I

UNIT II

System Reliability:

Series, parallel, series parallel system configuration. Approximation and bounds, meantime to failure, Stand-by operation. General approach to computation of system reliability, Computer methods of analysis.

UNIT III

Reliability Improvement – Introduction, Proper design and simplicity, Component improvement, Redundancy, Stand by redundancy, Repairable Systems, Basic ideas of maintainability, Evaluation of reliability of physical systems.

UNIT IV

Generating capacity—basic probability methods

Introduction , The generation system model, Generating unit unavailability, Capacity outage probability tables, Comparison of deterministic and probabilistic criteria, A recursive algorithm for capacity model building, Recursive algorithm for unit removal, Alternative model-building techniques, Loss of load indices, Concepts and evaluation techniques, Equivalent forced outage rate, Capacity expansion analysis, Evaluation techniques, Perturbation effects, Scheduled outages, LOLE computation

UNIT V

Generating capacity—frequency and duration method

Introduction , The generation model, Fundamental development, Recursive algorithm for capacity model building, System risk indices, Individual state load model, Cumulative state load model. Practical system'studies.

Interconnected systems

Introduction, Probability array method in two interconnected systems, Evaluation techniques, Equivalent assisting unit approach to two interconnected systems, Factors affecting the emergency assistance available through the interconnections

References Books:

1. Systems reliability – Jacob / Russel
2. Systems reliability – Chowdury / Nagpal
3. Power System Reliability Evaluation, Roy Billinton University of Saskatchewan, and Ronald N. Allan.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Power System)

SEMESTER I

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MTPS124		HIGH VOLTAGE ENGINEERING	2	0	0	2	60	20	20	0	0

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

The Students

1. Will Be Able to familiarize with various types of Generation and Measurements of High Voltage AC, DC and Impulse waves
2. They will be able to know about the breakdown phenomenon in solid, liquid and gases dielectrics
3. And will get the general idea about electrostatics fields and field stress control.

Course Outcomes:

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

The students will be able to

1. Know why we use high voltage (HV), HV types, and HV applications.
2. Know generation and measurement of HV alternating voltages,direct voltages and impulse voltages.
3. Know HV parameters, generation and measurement principles, and methods
4. To acquire and apply knowledge of mathematics and electromagnetic fields in Electrical engineering and compute electrostatics fields and field stress control.
5. Master the methods for analyzing various discharges, which include the gas, liquid and solid discharge?
6. Optimally design insulation scheme for power apparatus.

Syllabus:

UNIT -I

Generation of High Voltages:

Direct Voltage: AC to DC converter, Electrostatic Generators; Alternating **Voltage:** TestingTransformer, Series Resonant Circuit; **Impulse Voltage:** Impulse voltage generator circuits, Design, construction and operation of generator and control system.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Master of Technology (Power System)
SEMESTER I

UNIT -II

Measurement of High Voltages: Introduction to Sphere gap, Rod gap and uniform field gap; The Chubb-Fortes cue method, Voltage divider and passive rectifier circuits, Active peak reading circuit, High voltage capacitor measuring circuits, Voltage divider system and measurement of impulse voltage, Fast digital transient recorder for impulse voltage measurement.

UNIT -III

Electrostatic field and field stress control: Electrical field distribution and breakdown strength ofinsulating materials, Fields in homogeneous and multi dielectric isotopic materials, Numerical methods.

UNIT -IV

Breakdown in Gases: Classical gas laws, Ionization and decay process, Cathode process-secondary effects, The Townsend mechanism, Streamer mechanism of spark, Paschen's law, penning effect,Breakdown field strength, Breakdown in non-uniform field, Effect of electron attachment on breakdown criteria, Influence of space charge-Polarity effect, Surge breakdown voltage-time lag and Corona.

UNIT -V

Breakdown in Solid & Liquid dielectrics: Intrinsic, Streamer, electromechanical, thermal anderosion breakdown of solid dielectrics; Treeing and Tracking in solid insulating materials, Electronic and suspended solid particle breakdown mechanism, cavity breakdown, Electro convection and electro hydrodynamic model of dielectrics, Static electrification in Power Transformer.

Reference Books

1. Conduction and Breakdown in Mineral Oils By A.A. Zaky and R. Hawley..Pergamon Press,Oxford, 1973.
2. Simple Dielectric Liquids by T.J. Gallagher. Clarendon Press, Oxford, 1975.
3. Dielectric Relaxation in Solids. By A.K. Jonscher,.Chelsea Dielectrics Press, London, 1983.
4. Electronic Processes in Non-crystalline Materials. N.F Mott and E.A. Davies Oxford UniversityPress 1979.
5. High Voltage Measurement Techniques A.J. Schwab. M.I.T Press, 1972.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Power System)

SEMESTER I

Common for Power System / Power Electronics

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME THEORY END SEM University Exam	Two Term Exam	Teachers Assessment*	PRACTICAL END SEM University Exam	Teachers Assessment*
MTPS 134		SOFT COMPUTING	2	0	0	2	60	20	20	0	0

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

The Students (A) Will Be Able to familiarize with different soft computing techniques (B) with emphasis on their analysis and application to practical engineering problems(C) efficiently & effectively (D)

Course Outcomes:

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

The students will be able to

1. Identify various methods and models of neural network.
2. Classify, formulate, and train neural network architecture.
3. Classify, formulate fuzzy logic system.
4. Demonstrate the knowledge of genetic algorithm.
5. Identify and apply soft computing techniques in engineering problem.

Syllabus:

UNIT I

Artificial Neural Network

Introduction to soft computing - soft computing vs. hard computing- various types of soft computing techniques- applications of soft computing-Neuron- Nerve structure and synapseArtificial Neuron and its model- activation functions- Neural network architecture- single layer and multilayer feed forward networks- McCullochPitts neuron model- perceptron model- Adaline and Madaline- multilayer perception model- back propogation learning methods- effect of learning rule coefficient -back propagation algorithm- factors affecting back propagation training applications..

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Power System)

SEMESTER I

UNIT II

Artificial Neural Network

Counter propagation network- architecture- functioning & characteristics of counter- Propagation network-Hopfield/ Recurrent network- configuration- stability constraints-associative memory and characteristics- limitations and applications- Hopfield v/s Boltzman machine- Adaptive Resonance Theory- Architecture- classifications-Implementation and training-Associative Memory.

UNIT III

Fuzzy Logic System

Introduction to crisp sets and fuzzy sets- basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modeling and control- Fuzzification- inferencingand defuzzificationFuzzy knowledge and rule bases-Fuzzy modeling and control schemes for nonlinear systems. Self organizing fuzzy logic control- Fuzzy logic control for nonlinear time delay system.

UNIT IV

Genetic Algorithm

Basic concept of Genetic algorithm and detail algorithmic steps-adjustment of free Parameters, Solution of typical control problems using genetic algorithm- Concept on some other search techniques like tabu search and ant colony search techniques for solving optimization problems.

UNIT V

Applications

GA application to power system optimization problem- Case studies: Identification and control of linear and nonlinear dynamic systems using Matlab-Neural Network toolbox. Stability analysis of Neural Network interconnection systems- Implementation of fuzzy logic controller using Matlab fuzzy logic toolbox-Stability analysis of fuzzy control systems.

References Books:

1. Laurene V. Fausett, Fundamentals of Neural Networks: Architectures, Algorithms And Applications, Pearson Education,
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
3. Zimmermann H.J. "Fuzzy set theory and its Applications" Springer international edition, 2011.
4. David E. Goldberg, "Genetic Algorithms in Search, Optimization, and Machine Learning", Pearson Education, 2009.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore