Chhattisgarh Swami Vivekanand Technical University Bhilai (C.G.)

SCHEME OF EXAMINATION
DEPARTMENT OF ELECTRICAL ENGINEERING

M.E. in Power Systems Engineering

THIRD SEMESTER

S. No.	Board of Study	Subject Code	Subject	Periods per week			Scheme of exam			Total Marks	Credit L+(T+P)/2
				L	T	P	Theory/Practical				
							ESE	CT	TA		
1.	Electrical Engineering	559311 (24)	Power System Planning & Management	3	1	-	100	20	20	140	4
2.	Refer Table- III		Elective-III	3	1	-	100	20	20	140	4
3.	Electrical Engineering	559421 (24)	Project	-	-	28	100	-	100	200	14
4.	Electrical Engineering	559422 (24)	Seminar	-	-	3			20	20	2
TOTAL				**6**	**2**	**31**	**300**	**40**	**160**	**500**	**24**

L-Lecture, T- Tutorial, P- Practical, ESE- End Semester Examination, CT- Class Test, TA- Teacher's Assessment

Table -III

Elective- III			
S. No.	**Board of Study**	**Subject Code**	**Subject**
1	Electrical Engg.	559331 (24)	Energy Conservation & Audit
2	Electrical Engg.	559332 (24)	ANN & Fuzzy Techniques
3	Electrical Engg.	559333 (24)	Power System Reliability

Note (1) – **1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session .**

Note (2) – **Choice of elective course once made for an examination cannot be changed i n future examinations.**

Chhattisgarh Swami Vivekanand Technical University Bhilai (C.G.)

Semester: **M.E. III**
Subject: **Power System Planning & Management**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Specialization: **Power Systems Engg.**
Branch: **Electrical Engineering**
Code: 559311 (24)
Total Tutorial Periods: **12**

Unit- 1:
Introduction of power planning, National and Regional Planning, structure of P.S., planning tools, Electricity Regulation, Electrical Forecasting, techniques and modeling.

Unit- 2:
Generation planning, Integrated power generation cogeneration/captive power, Power pooling and power trading. Transmission and distribution planning. Power System Economics. Power sector finance, financial planning, private participation Rural Electrification investment, concept of rational tariffs.

Unit- 3:
Power supply Reliablity, Reliability planning. System operation planning, load management, load prediction, reactive power balance, online power flow studies, state estimation, computerized management, power system simulator.

Unit- 4:
Computer aided planning, wheeling. Environmental effects, the green house effect, Technological impacts. Insulation coordination. Reactive compensation.

Unit- 5:
Optimal power system expansion planning : Formulation of least cost optimization problem incorporating the capital, operating and maintenance cost of candidate plants of different types (Thermal, Hydro, Nuclear, Non-conventional etc.) and minimum assured reliability constraint – optimization techniques for solution by programming.

Text Books:

1. Electrical Power System Planning by A.S.Pabla – Macmillan India Ltd.
2. X.Wang & J.R. Mc Donald , “Modern Power system planning”, McGraw. Hill, 1993

References:

1. A.S Pabla , “Electrical Power system planning”, Mac Millan,Delhi,1998
2. Sullivan, “Power system planning”, McGraw. Hill, 1977
3. Power Distribution Planning Reference Book By H. Lee Willis, CRC Press, 2004.
4. Makridakis, Spyros, “Forecasting methods and application”, John Wiley, 1993

Chhattisgarh Swami Vivekanand Technical University Bhilai (C.G.)

Semester: **M.E. III** Specialization: **Power Systems Engg.**
Subject: **Energy Conservation & Audit** Branch: **Electrical Engineering**
Total Theory Periods: **40** Code: 559331 (24)
Total Marks in End Semester Exam. : **100** Total Tutorial Periods: **12**
Minimum number of class test to be conducted: **02**

Unit 1

System approach and End use approach to efficient use of Electricity; Electricity tariff types; Energy auditing: Types and objectives - audit instruments - ECO assessment and Economic methods - specific energy analysis - Minimum energy paths - consumption models-Case study.

Unit 2

Electric motors, Energy efficient controls and starting efficiency, Motor Efficiency and Load Analysis, Energy efficient /high efficient Motors, Case study; Load Matching and selection of motors.
Variable speed drives; Pumps and Fans, Efficient Control strategies, Optimal selection and sizing, Optimal operation and Storage; Case study

Unit 3

Transformer Loading/Efficiency analysis, Feeder/cable loss evaluation, case study, Reactive Power management, Capacitor Sizing, Degree of Compensation, Capacitor losses-Location, Placement, Maintenance, case study;
Peak Demand controls - Methodologies, Types of Industrial loads, Optimal Load scheduling - case study.

Unit -4

Lighting- Energy efficient light sources-Energy conservation in Lighting Schemes- Electronic ballast- Power quality issues - Luminaries, case study;

Cogeneration - Definition and scope, topping and bottoming cycles, cogeneration technologies, industry suitable for cogeneration, sale of electricity to utility, impact of pricing on cogeneration, integrated energy system, potential of cogeneration in India.

Unit -5

Electric loads of Air conditioning & Refrigeration - Energy conservation measures- Cool storage .Types- Optimal operation-case study; Electric water heating-Gysers-Solar Water Heaters- Power Consumption in Compressors, Energy conservation measures; Electrolytic Process; Computer Controls - softwares-EMS

Text Books:

1. IEEE Bronze Book- .Recommended Practice for Energy Conservation and cost effective planning in Industrial facilities. IEEE Inc, USA. Giovanni
2. Petrecca, .Industrial Energy Management: Principles and Applications., The Kluwer international series -207,(1999)

References:

1 Anthony J. Pansini, Kenneth D. Smalling, .Guide to Electric Load Management., Pennwell Pub; (1998)
2 Howard E. Jordan, Energy-Efficient Electric Motors and Their Applications., Plenum Pub Corp; 2nd edition (1994)
3 Turner, Wayne C., .Energy Management Handbook., Lilburn, The Fairmont Press, 2001
4 Albert Thumann , .Handbook of Energy Audits., Fairmont Pr; 5th edition (1998)
5 Albert Thumann, P.W, Plant Engineers and Managers Guide to Energy Conservation. - Seventh Edition-TWI Press Inc, Terre Haute.
6 Donald R. W., .Energy Efficiency Manual., Energy Institute Press
7 Tripathy S.C.,'Electric Energy Utilization And Conservation', Tata McGraw Hill.
8 NESCAP -Guide Book on Promotion of Sustainable Energy Consumption

Chhattisgarh Swami Vivekanand Technical University Bhilai (C.G.)

Semester: **M.E. III**
Subject: **ANN & Fuzzy Techniques**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Specialization: **Power Systems Engg.**
Branch: **Electrical Engineering**
Code: 559332 (24)
Total Tutorial Periods: **12**

Unit I : Biological neurons and their artificial models, models of artificial neural networks, feed forward and feed backward networks, supervised and unsupervised learning,

Neural network learning rules - Hebbian rule, perceptron rules, delta rules, Widrow-Hoff rule, correlation rule, winner- take- all rule, outstar learning rule.

Unit II: Single Layer Perceptron Classifier: Classification model, features, decision regions, discriminant functions, linear machine and minimum distance classification, training and classification using discrete Perceptron algorithm, single layer continuous Perceptron networks for linearly separable classification, multi category single layer Perceptron networks.

Multi Layer Feed Forward Networks- Linearly non-separable pattern classification, delta learning rule for multi Perceptron layer, genaralised delta rules, error back propagation training

Unit III: Single Layer Feedback Networks: Basic concepts of dynamical systems, mathematical foundation of discrete time Hopfield networks, mathematical foundation of gradient type Hopfield networks transient response of continuous time networks, relaxation modeling in single layer feedback networks, optimization problems.

Associative Memories: Basic concepts, linear associator, basic concept of and performance analysis of recurrent auto associative memory, bi-directional associative memory, associative memory of spatio-temporal patterns.

Unit-IV
Fuzzy sets. Fuzzy set operations . Properties, Membership functions, Fuzzy to crisp conversion. fuzzification and defuzzification methods, applications in engineering problems.

Unit V :
Fuzzy control systems. Introduction, simple fuzzy logic controllers with examples, special forms of fuzzy logic models, classical fuzzy control problems. Inverter pendulum. image processing . home heating system . Adaptive fuzzy systems, hybrid systems.

Texts

1. J.M. Zurada, .Introduction to artificial neural systems., Jaico Publishers, 1992.
2. Simon Haykins, .Neural Networks . A comprehensive foundation., Macmillan College, Proc, Con, Inc, New York, 1994.

References

1. D. Driankov, H. Hellendorn, M. Reinfrank, .Fuzzy Control . An Introduction., Narora Publishing House, New Delhi, 1993.
2. H.J. Zimmermann, .Fuzzy set theory and its applications., III Edition, Kluwer Academic Publishers, London.
3. G.J. Klir, Boyuan, .Fuzzy sets and fuzzy logic., Prentice Hall of India (P) Ltd., 1997.
4. Stamatios V Kartalopoulos, .Understanding neural networks and fuzzy logic . basic concepts and applications., Prentice Hall of India (P) Ltd., New Delhi, 2000.
5. Timothy J. Ross, .Fuzzy logic with engineering applications., McGraw Hill, New York.
6. Suran Goonatilake, Sukhdev Khebbal (Eds), .Intelligent hybrid systems., John Wiley & Sons, New York, 1995.

Chhattisgarh Swami Vivekanand Technical University Bhilai (C.G.)

Semester: **M.E. IIIrd** Specialization: **Power Systems Engg.**
Subject: **Power System Reliability** Branch: **Electrical Engineering**
Total Theory Periods: **40** Code: 559333 (24)
Total Marks in End Semester Exam. : **100** Total Tutorial Periods: **12**
Minimum number of class test to be conducted: **02**

UNIT 1
Generating Capacity Basic Probability Methods:- Introduction, The generation system model, Generating unit unavailability , Capacity outage probability tables, Comparison of deterministic and probabilistic criteria, Recursive algorithm for capacity model building , Recursive algorithm for unit removal, Alternative model –building techniques , Loss of load indices , Concepts and evaluation techniques , Numerical examples, Equivalent forced outage rate, capacity expansion analysis , Evaluation techniques , Perturbation effects, Scheduled outages , Evaluation methods on period bases , Load forecast uncertainty, Forced outage rate uncertainty , Exact method , Approximate method , Application, LOLE computation .

UNIT 2
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 , Base case study , System expansion studies , Load forecast uncertainty .

UNIT – III
Interconnected Systems:-Introduction , Probability array method in two interconnected system , Concepts , Evaluation techniques , Equivalent assisting unit approach to two interconnected system, Factors affecting the emergency assistance available through the interconnections, Introduction , Effect of tie capacity , Effect of tie line reliability , Effect of number of tie line , Effect of tie capacity uncertainty, Effect of load forecast uncertainty , Variable reserve versus maximum peak load reserve , Reliability evaluation in three interconnected systems, Direct assistance from two systems, Indirect assistance from two systems.

UNIT – IV
Operating Reserve:- General concepts, PJM method, Concepts, Outage replacement rate, Generation model , Unit commitment , Extensions to PJM method , Load forecast uncertainty, Derased (Partial output) stanes. Modified PJM method, Concepts, Area risk curves. Modelling rapid start unit, Modelling hot reserve units, Unit commitment risk, Numerical examples, Postponable outage, Concepts m Modelling postponable outages, Unit commitment risk , Security function approach , Concepts , Security function model, Response risk, Concepts, Evaluation techniques, Effect of disturbing spinning reserve, Effect of hydro- electric units, Effect of rapid start units, Interconnected systems. .

UNIT- V
Composite Generation and Transmission systems:- Introduction , Radial configurations , Conditional probability approach, Network configurations, State selection, Concepts , Application , System and load point indices , Concepts , Numerical evaluation, Application to practical systems. Data requirements for composite system reliability evaluation , Concepts , Deterministic data, Stochastic data , Independent outages, dependent outages, common mode outages, station originated outages.

Text Book:
1. Reliability Evaluation of Power System by Roy Billinton, Ronald and Allan, Plenun Press, NY-London.