SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

Sree Sainath Nagar, A. Rangampet-517 102

Department of Electrical and Electronics Engineering

Lesson Plan

Name of the Subject : Power System Security and State Estimation

Class & Semester : M. Tech. (EPS) – I Semester

Name of the faculty Member :**Dr. N.M.G.KUMAR**

S. No.	Topic	No. of periods	Book(s) followed	Topics for self-study
UNIT-I: POWER SYSTEM NETWORK MATRICES				
1	Formation of bus admittance matrices by direct inspection method.	2	T2,R2	Compute the Y_{bus} and Z_{bus} matrix using graphical methods with mutual's
2	Algorithm for formation of Bus impedance matrix:	1	T2,R2	
3	Addition of a branch	2	T2,R2	
4	Addition of a link,	2	T2,R2	
5	Removal element in Bus impedance matrix	2	T2,R2	
6	Simple problems.	2	T2,R2	
7	Π-representation of off-nominal tap transformers.	1	T2,R2	
	Total periods required:	**12**		
UNIT-II: POWER FLOW STUDIES				
8	Introduction to load flow analysis, Classification of buses, SLFE	2	T2,R2	Develop the MATLAB program for IEEE test systems
9	Gauss-Seidal method- flow charts	2	T2,R2	
10	Newton Raphson method polar format	2	T2,R2	
11	Newton Raphson method Rectangular format-flow charts	1	T2,R2	
12	Decoupled load flow method- flow charts	1	T2,R2	
13	Fast Decoupled load flow method - flow charts	1	T2,R2	
14	Comparison of load flow methods	1	T2,R2	
15	DC power flow method - flow charts	2	T2,R2	
16	Simple problems for each method is one minimum of 4 bus system	3	T2,R2	
	Total periods required:	**15**		
UNIT-III: FAULT ANALYSIS				
17	Short circuit studies- introduction, matrices for various faults- three phase system, Rotating, Stationary Elements	2	T2,R2	Develop the MATLAB program for IEEE test system fault calculations
18	short- circuit calculations using Z_{bus}, Z_f^{abc}	1	T2,R2	
19	short-circuit calculations using Z_f^{abc}, Z_f^{012}	1	T2,R2	
20	short-circuit calculations using Y_f^{abc}, Y_f^{012}	1	T2,R2	
21	Analysis of balanced three phase faults - Simple problems.	2	T2,R2	
22	Analysis of unbalanced three phase faults - Simple problems.	2	T2,R2	
23	Standard two machine system problem	2	T2,R2	

	Total periods required:	**11**		
UNIT-IV: POWER SYSTEM SECURITY				
24	Introduction to - power system security	1	T1,R1	Apply the concepts of system security estimation techniques for real world applications
25	Factors influencing power system security	1	T1,R1	
26	Contingency analysis: Detection of Network problems	2	T1,R1	
27	An overview of security analysis, linear sensitivity factors	2	T1,R1	
28	AC power flow methods, Contingency selection	2	T1,R1	
29	concentric relaxation	1	T1,R1	
30	Bounding- simple problems.	2	T1,R1	
	Total periods required:	**11**	T1,R1	
UNIT V: STATE ESTIMATION IN POWER SYSTEM				
31	Introduction to power system State Estimation	2	T1,R1	Apply the concepts of state estimation techniques for real world applications
32	Method of least squares	2	T1,R1	
33	Statistics – errors – estimates	2	T1,T2	
34	Test for bad data	1	T1,R1	
35	Structure and formation of Hessian matrix	2	T1,R1	
36	Power system state estimation mathematical modelling	1	T1,R1	
37	Simpleproblems.	2	T1,R1	
	Total periods required:	**12**		
	Grand total periods required:	**59**		

TEXT BOOKS:

1. Allen J.Wood and Wollenberg B.F., *Power Generation Operation and control*, John Wiley & Sons, 2nd edition,2006.
2. Nagrath, I.J. and *Kothari D.P., Modern Power System Analysis,* TMH, New Delhi,2004.

REFERENCES:

1. Grainger, J.J. and Stevenson, W.D.,*Power System Analysis*, Tata McGraw Hill, New Delhi, 2003.
2. Stagg and El Abiad*: Computer methods in power systems analysis*, McGraw Hill ISE, 1986.

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Signature of the Chairman (BOS)

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

Sree Sainath Nagar, A. Rangampet-517 102

Department of Electrical and Electronics Engineering

Name of the Subject : Static and Digital Protection of Power Systems
Class & Semester : M. Tech. (EPS) – I Semester

Name of the faculty Member : **Dr. M. S. Sujatha**

S. No.	Topic	No. of periods	Book(s) followed	Topics for self-study
UNIT – I: INTRODUCTION TO STATIC AND DIGITAL RELAYS				
1	Basic construction of static relays	1	T1	Basic principle of operation of relay.
2	Advantages of static relays	1	T1	
3	Level detectors	1	T1	
4	Replica impedance, mixing circuits	2	T1	
5	General equation for two input phase and amplitude comparators	2	T1	
6	Duality between amplitude and phase comparator	2	T2	
7	Numerical Relays Block diagram of typical Numerical Relay, Advantages and Disadvantages.	1	T2	
Total periods required:		**10**		
UNIT – II: COMPARATORS				
8	Circulating current type rectifier bridge comparators.	2	T1	Operation of rectifier bridges.
9	Opposed voltage type rectifier bridge comparators.	2	T1	
10	Direct and Instantaneous comparators.	1	T1	
11	Coincidence circuit type block spike phase comparator.	1	T1	
12	Techniques to measure the period of coincidence.	1	T1	
13	Integrating type.	1	T1	
14	Rectifier and vector product type phase comparators.	2	T1	
15	Conicsection characteristics	1	T1	
16	Three input amplitude comparator, Hybrid comparator.	2	T1	
Total periods required:		**13**		
UNIT -III: STATIC OVER CURRENTAND DIFFERENTIAL RELAYS				
17	Introduction to over current relay	1	R1	Electromagnetic type over current relays.
18	Instantaneous over current relay	1	R1	
19	Inverse Time overcurrent relays	1	T2	
20	Definite time over current relay	1	T2	
21	Inverse definite time over current relay.	1	T2	
22	Analysis of static differential relays.	2	T2	
23	Static relay schemes.	1	T1	
24	Duo bias transformer differential	2	T2	

	protection.			
25	Harmonic restraint relay.	1		
Total periods required:		**11**		
UNIT – IV: STATIC DISTANCE RELAYS				
26	Static impedance and reactance relays.	1	T2	Electromagnetic type distance relays.
27	MHO and angle impedance relays.	2	T2	
28	Sampling comparator.	1	T1	
29	Realization of reactance and MHO relay using a sampling comparator.	2	T2	
30	Effect of power swings on the performance of Distance relays.	2	T2	
31	Principle of out of step tripping and blocking relays.	1	T2	
32	Effect of line length and source impedance on distance relays.	1	T2	
Total periods required:		**10**		
UNIT – V: MICROPROCESSOR BASED PROTECTIVERELAYS				
33	Microprocessor based Overcurrentrelays–impedancerelays–directionalrelay–reactancerelay.	3	T2	Review of 8085 and 8086 microprocessors, ALP programs.
34	Generalized mathematical expression for distance relays.	1	T2	
	Measurement of Resistance and Reactance relays.	2	T2	
35	MHO and Offset MHO relays.	2	T2	
36	Realization of MHO and offset MHO characteristics.	2	T2	
37	Microprocessor Implementation of Digital Distance Relaying Algorithms.	1	T2	
Total periods required:		**11**		
Grand total periods required:				**55**

TEXT BOOKS:

1. T.S. Madhava Rao, *Power system Protection static relay*, 2nd Edition, Tata McGrawHill Publishing Company limited, 2004.
2. Badri Ram and D.N. Vishwakarma, *Power system Protection and Switchgear*, 2nd Edition, Tata McGraw Hill Publication Company limited, 2013.

REFERENCE BOOKS:

1. Bhuvanesh A Oza, Nirmal Kumar C Nair et., al., *power system protection and switchgear*, Tata McGraw Hill Publication Company Limited.

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SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

Sree Sainath Nagar, A. Rangampet-517 102

Department of Electrical and Electronics Engineering

Lesson Plan

Name of the Subject : ADVANCED POWER SYSTEM STABILITYANALYSIS

Class & Semester : M. Tech. (EPS) – I Semester

Name of the faculty Member :**Dr. N.M.G.KUMAR**

S. No.	Topic	No. of periods	Book(s) followed	Topics for self-study
UNIT-I: THE ELEMENTARY MATHEMATICAL MODEL				
1	AClassicalmodelof SMIB	2	T1,R1	Realize various power system component models for Stability analysis using MATLAB package
2	System response to small disturbances: methods, unregulated Machine.	2	T1, R1	
3	Torque speed characteristics of regulated synchronous Machine	1	T1	
4	Regulated synchronousmachine	1	T1	
5	Voltageregulatorwithonetimelag	2	T1	
6	Governorwith one time lag	1	T1	
7	Classical model of multi-machine system	1	T1	
8	ModesofoscillationofanunregulatedMultimachine system	2	T1,R1	
9	Problems	2	T1,R1	
	Total periods required:	**14**		
UNIT-II: THE SYNCHRONOUS MACHINE				
11	Clarks and Park's Transformation	2	T1,R1	Sate space solution for SMIB system using programming techniques
12	flux linkage equations, self and mutual inductances of stator and rotor	2	T1	
13	transformation of inductances	2	T1	
14	state space model of SMIB in voltage	2	T1,T2	
15	state space model of SMIB in current	1	T1	
16	EffectofexcitationonDynamicstability	1	T1,R1	
17	examination of dynamic stability by Routh's criterion	2	T1, R1	
	Total periods required:	**12**		
UNIT-III: EXCITATION SYSTEMS				
18	Simplified view of excitation control, Control configuration	1	T1,R1	Stability analysis using SIMULINK/MATLAB package
19	Excitation system response , Non-continuously regulated systems	2	T1, R1	
20	continuously regulated systems	1	T1,R1	
21	Excitation system compensation	1	T1, R1	
22	state space description of the excitation system simplified linear model	1	T1,R1	
23	Type –2system: rotating rectifier system,	2	T1,R1	
24	Type-3 system: Static with terminal potential and current supplies,	1	T1, R1	

25	Type –4system:non–continuousacting - Block diagram representation–state space modeling	1	T1,R1	
	Total periods required:	**10**		
UNIT-IV: EFFECT OF EXCITATION ON STABILITY				
26	Introduction to effectof excitation on generator power limits	1	T1	Numerical verification using MATLAB package
27	Effect of the excitation system on Transient stability.	1	T1	
28	Approximate model of the complete exciter generator system	1	T1	
	Supplementary stabilizing signals	2	T1,T2	
30	Lead compensation	1	T1	
31	Stability aspect using Eigen value approach	2	T1, R1	
	Total periods required:	**8**		
UNIT V: VOLTAGE STABILITY ANALYSIS				
32	What is voltage stability–Factors affecting voltage instability and collapse	2	T2,R1	Stability analysis using MATLAB package
33	ComparisonofAngleandvoltagestability	2	T2,R1	
34	Analysisofvoltageinstability collapse – Controlof voltage instability	1	T2,R1	
35	Review of Lyapunov's stability theorems of non-liner systems	1	R2	
36	Method based on first concept	1	R2	
37	Method based on first integrals	1	R2	
38	Quadratic forms	1	R2	
39	Variable gradient method	1	R2	
40	Zubov's method	1	R2	
41	Popov's method,	1	T2,R2	
42	Lyapunov function for single machine connected to infinite bus	1	T2,R2	
	Total periods required:	**13**		
	Grand total periods required:	**57**		

TEXT BOOKS:

1. P.M.Anderson, A.A.Fouad, *Power System Control and Stability*, 2nd edition, IEEE Press, 2003.
2. K.R.Padiyar, *Power System Dynamics (Stability & Control)*, 2nd edition, B.S.Publications, Hyderabad, India, 2008.

REFERENCES:

1. Prabha Kundur, Neal J.Balu, Mark G.Lauby, *Power System Stability and Control*, 2nd edition, McGraw-Hill, 1994.
2. M.A.Pai, *Power System Stability–Analysis by the direct method of Lyapunov*, North Holland Publishing Company, Newyork, 1981.

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SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)
Sree Sainath Nagar, A. Rangampet-517 102

Department of Electrical and Electronics Engineering

Name of the Subject : Power Electronic Converters
Class and Semester : M. Tech. (EPS) – I Semester
Name of the faculty Member:T SUNEEL KUMAR

S. No.	Topic	No. of periods	Book(s) followed	Topics for self-study
UNIT – I: MODERN POWER SEMICONDUCTOR DEVICES				
1	Power Diode - Reverse recovery characteristics – types	1	T1,T2	Analysis of Power Diode, BJT, MOSFET, IGBT, THYRISTOR, GTO and IGCT using PSPICE
2	Power transistors steady state characteristics and switching characteristics	1	T1,T2	
3	IGBT steady state characteristics and switching characteristics	1	T1,T2	
4	Thyristor steady state characteristics and switching characteristics	2	T1,T2	
5	GTO – IGCT– steady state characteristics and switching characteristics	1	T1,T2	
6	Gate drive circuits for SCR, MOSFET	1	T1,T2	
7	Gate drive circuits for IGBT, Base drive circuit for Power BJT. Comparison of power devices.	2	T1,T2	
Total periods required:		**9**		
UNIT – II: MULTIPULSE CONTROLLED RECTIFIERS				
8	Six pulse SCR rectifiers - semi converters, operation with different firing angles, power factor and THD	2	T1	PSPCE Simulation of single phase and three phase half and fully controlled converters for different loads.
9	Six pulse SCR rectifiers – full converters, operation with different firing angles power factor and THD	2	T1	
10	Effect of line inductance	1	T1	Plot wave forms for 12 and 24 pulse converters for 45^0, 90^0 and 120^0firing angles for different loads.
11	Power factor improvements- extinction angle control, symmetric angle control PWM control-single and three phase control	2	T1	
12	Three phase dual converters Operation with different α angles	1	T1	
13	Twelve pulse SCR rectifiers- idealized 12 pulse rectifier operation, effect of line and leakage inductance, power factor and THD	2	R1	
14	Single phase series converters	1	T1	
15	18 pulse SCR rectifiers, operation.	1	R1	
16	24 pulse SCR rectifiers, operation.	2	R1	
Total periods required:		**14**		

UNIT -III: AC VOLTAGE CONTROLLERS AND CYCLOCONVERTERS				
17	Single phase AC voltage controllers with R, RL and RLE loads – operation and waveforms	2	T1,T2	PSPICE Simulation of single phase and three phase ac voltage controllers. Plot wave forms of single phase and three phase AC voltage controllers for firing angles 90^0, 120^0 for different loads. Plot wave forms of single phase and three phase cycloconverters for firing angles 90^0, 120^0 for different loads.
18	AC voltage controllers with PWM Control	1	T1	
19	Effects of source and load inductances on AC voltage controllers	1	T1	
20	Synchronous tap changers – Applications	1	T1	
21	Three Phase AC Voltage Controllers – Analysis of controllers with star and delta Connected – applications	1	T1	
22	numerical problems	1	T1	
23	Single phase cycloconverters – analysis of Midpoint and bridge configurations – Limitations	1	T1	
24	three phase cycloconverters – analysis of Midpoint and bridge configurations – Limitations	1	T1	
25	Advantages – Applications – numerical problems	1	T1	
Total periods required:		**10**		
UNIT – IV: ANALYSIS OF DC-DC AND RESONANT CONVERTERS				
26	Voltage commutated chopper - operation	1	R3	PSPICE Simulation of Buck, Boost, Buck-Boost regulators Brief study of Bi directional DC-DC converters, topologies, applications.
27	current commutated chopper- operation	1	R3	
28	switch mode regulators – buck regulators	1	T1,T2,R2	
29	boost regulators, buck-boost regulators	1	T1,T2,R2	
30	cuk regulators – condition for continuous inductor current and capacitor voltage design of LC filter – comparison of regulators	2	T1	
31	Multi-output boost converters - advantages applications	1	T1	
32	Numerical problems	1	T1	
33	Resonant Converters- Concept of ZVS and ZCS, principle of operation	2	T1,R2	
34	Analysis of M-type and L-type Converters.	2	T1,R2	
Total periods required:		**12**		
UNIT – V: PWM AND MULTI LEVEL INVERTERS				
35	Voltage control of single phase inverters using single, multiple PWM	2	T1	PSPICE simulation of three phase PWM inverter. Requirements of hardware components in design of PWM generators.
36	Sinusoidal, modified sinusoidal pulse width modulation, phase displacement control for voltage control of single phase inverter	2	T1	
37	Advanced PWM techniques-trapezoidal, staircase, stepped, harmonic injection, delta modulations.	2	T1	
38	sinusoidal PWM, 60 degree PWM,	1	T1	
39	Voltage control of three phase inverter using Third harmonic PWM, space vector modulation.	1	T1	

40	Harmonic reduction techniques for inverters	2	T1	
41	diode clamped Multilevel inverters operation, features, applications	1	T1	
42	flying capacitor Multilevel inverters operation, features, applications	1	T1	
43	cascaded Multilevel inverters operation, features, applications	1	T1	
Total periods required:		**13**		
Grand total periods required:		**58**		

TEXT BOOKS:

1. Rashid M.H., *Power Electronics circuits, devices and applications*, 3rd edition, Prentice Hall publications, 2009.
2. Ned Mohan, Undeland and Robbin, *Power Electronics: converters, Application and Design*, John Wiley and sons Inc., Newyork, 1995.

REFERENCE BOOKS:

1. Bin Wu, *High power converters and AC Drives*, John Wiley and Sons, 2006.
2. P.C Sen, *Modern Power Electronics*, 1st edition, Wheeler publishing Company, 1998.
3. Dr.P.S Bimbhra, *Power Electronics*, 4th edition, Khanna publishers, 2007.

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SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

Sree Sainath Nagar, A. Rangampet-517 102

Department of Electrical and Electronics Engineering

Name of the Subject :ADVANCED CONTROL SYSTEMS
Class& Semester :M. Tech. (EPS) – I Semester
Nameof the faculty Member :**Dr. T.DEVARAJU**

S. No.	Topic	No. of periods	Book(s) followed	Topics for self-study
UNIT – I:CONTROLLABILITY AND OBSERVABILITY				
1	Concept of controllability and observability	1	T1	Controllability and observability tests & verification through MATLAB.
2	Tests for Controllability and Observability, Kalmans test and Gilbert's test for Continuous Time Systems	2	T1,T2&T3	
3	Kalmans Principle of Duality	1	T1&T3	
4	Controllability and Observability for JCF	2	T1& T2	
5	Controllability and Observability for CCF and OCF	2	T1	
6	Effect of State Feedback on Controllability and Observability.	2	T1	
	Total periods required:	**10**		
UNIT – II: ANALYSIS OF NONLINEAR SYSTEMS				
1	Introduction to Non-linear Systems	1	T3	Derivation of descrining functions for the combination of different non linearities.
2	Types of physical Non-linearities	1	T3	
3	Characteristics of Physical Non-Linearities	1	T3	
4	Describing Functions for Non-Linear systems	1	T3	
5	Derivation of Describing Functions: Dead Zone, Saturation, Backlash, Relay With Dead Zone and Hysteresis	3	T3	
6	Introduction to Phase-Plane Analysis	1	T3	
7	Singular Points	1	T3	
8	Isocline Method for Constructing Trajectories	1	T3	
9	Delta Method	1	T3	
	Total periods required:	**11**		
UNIT - III: STABILITY ANALYSIS				
1	Stability in the Sense of Lyapunov	1	T1	Definiteness and Sylvester principle.
2	Lyapunov's stability Theorems	2	T1	
3	Graphical representation of Stability	1	T1	
4	Second method of Lyapunov	1	T1	
5	Lyapunov functions	2	T1	
6	Variable Gradient Method	2	T1	
7	Krasovaskii's Method	1	T1	
	Total periods required:	**10**		
UNIT – IV: CONTROLLERS AND OBSERVERS DESIGN				
1	Application of Controllability &Observability in LTI systems	2	T1,T2&T3	State feedback controller design using MATLAB
2	Design of State Feedback Control through Pole Placement	2	T1,T2&T3	
3	Full Order Observer and Reduced Order Observer	2	T2&T3	

4	State regulator problem	2	T2	
5	Riccati equation	1	T2	
Total periods required:		**9**		
UNIT – V: OPTIMAL CONTROL				
1	Introduction to Optimal Control	1	T1	Transverality condition and E-L equation. Pontroygens principle.
2	Formulation of Optimal Control Problems	1	T1	
3	Calculus of Variations, Minimization of functionals of Single Function	2	T1	
4	Euler Lagrange Equation	2	T1	
5	2 point Boundary value problems	2	T1	
6	Constrained Minimization, Minimum Principle	1	T1	
7	Control Variable Inequality Constraints	1	T1	
8	Control and State Variable Inequality Constraints.	1	T1	
Total periods required:		**11**		
Grand total periods required:		**51**		

TEXT BOOKS:

1. M. Gopal, *Modern Control System Theory*, 2nd edition, New Age International Publishers, 1996.
2. K. Ogata, *Modern Control Engineering*, 3rd edition,Prentice Hall of India, 1998.
3. A. Nagoorkani, Advanced Control Theory, 3rd edition, RBA Publications, 2007

REFERENCE BOOKS:

1. I.J. Nagrath and M.Gopal, *Control Systems Engineering*, New Age International (P) Ltd. 2007.
2. M. Gopal, *Digital Control and State Variable Methods*, Tata Mc Graw-Hill Companies, 1997.

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SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

Sree Sainath Nagar, A. Rangampet-517 102

Department of Electrical and Electronics Engineering

Lesson Plan

Name of the Subject :REACTIVE POWER COMPENSATION AND MANAGEMENT

Class& Semester :M. Tech. (EPS) – I Semester

Nameof the faculty Member : **Dr. P. Umapathi Reddy**

S. No.	Topic	No. of periods	Book(s) followed	Topics for self-study
UNIT – I:Reactive Power Compensation				
1	Need for Reactive Power compensation	2	T1	
2	Reactive power characteristics, ideal and Practical compensators	2	T1	
3	Power factor correction and voltage regulation	2	T1	
4	Load compensator as a voltage regulator	2	T1	
5	Phase balancing, power factor correction of unsymmetrical loads, Examples	2	T1	
Total periods required:		**10**		
UNIT – II: Reactive power compensation in transmission system				
6	Steady state Reactive power compensation and uncompensated line	2	T1	
7	Types of compensation and Passive shunt compensation	2	T1	
8	Series compensation, Dynamic shunt compensation and examples	2	T1	
9	Transient state Reactive power compensation and Characteristic time periods	1	T1	
10	Passive shunt compensation	1	T1	
11	Static compensations and series capacitor compensation	2	T1	
12	Compensation using synchronous condensers and examples.	2	T1	
Total periods required:		**12**		
UNIT-III:Reactive power coordination				
13	Reactive power coordination objective	1	T1	
14	Mathematical modeling	1	T1	
15	Operation planning and transmission benefits	2	T1	
16	Basic concepts of quality of power supply	1	T1	
17	Disturbances and steady – state variations	2	T1	
18	Effects of under voltages and frequency	1	T1	
19	Harmonics, radio frequency and electromagnetic interferences	2	T1	
Total periods required:		**10**		

UNIT-IV: Reactive power Management				
20	Demand side management and Load patterns	1	T2	Calculation of Energy bill for domestic and Industrial sectors – case study
21	Basic methods of load shaping	2	T2	
22	Power tariffs	1	T2	
23	KVAR based tariffs, penalties for voltage flickers and harmonic voltage levels	1	T2	
24	Distribution side Management, System losses	2	T2	
25	Loss reduction methods - examples	1	T2	
26	Reactive power planning: objectives	2	T2	
27	Economic Planning, Capacitor placement	1	T2	
28	Retrofitting of capacitor banks	1	T2	
Total periods required:		**12**		
UNIT-V: Reactive power management in Domestic &Industrial Sectors				
29	KVAR requirements for domestic appliances	1	T2	Reactive power control equipment in a distribution substation and their ratings
30	Purpose of using capacitors and selection of capacitors	1	T2	
31	Deciding factors, types of available capacitor, characteristics and Limitations	2	T2	
32	Typical layout of traction systems and reactive power control requirements	2	T2	
33	Distribution transformers and Electric arc furnaces	2	T2	
34	Reactive power control in Textile and Plastic industries	2	T2	
35	Furnace transformer, filter requirements and remedial measures	1	T2	
36	Power factor of an arc furnace	1	T2	
Total periods required:		**12**		
Grand total periods required:		**56**		

TEXT BOOKS:

T1. T.J.E.Miller, *Reactive power control in Electric power systems*, John Wiley and Sons, 1982

T2. D.M. Tagare, *Reactive power Management*, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004.

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SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

Sree Sainath Nagar, A. Rangampet-517 102

Department of Electrical and Electronics Engineering

Name of the Subject :Research Methodology

Class& Semester :M. Tech. (EPS) – I Semester

Nameof the faculty Member :**Dr. S. Farook**

S. No.	Topic	No. of periods required	Book(s) followed	Topics for self study
Unit-I: Introduction to Research Methodology				
1.	Research objective and Motivation	1	T1	Problems encountered by researchers.
2.	Types of Research –Descriptive vs Analytical, Applied vs Fundamental, Quantitative vs Qualitative, Conceptual vs Empirical	1	T1	
3.	Research Approaches	1	T1	
4.	Research and Scientific Methods	1	T1	
5.	Research Process	2	T1	
6.	Criteria of Good Research	1	T1	
	Total of periods required:	**7**		
Unit-II: Research Problem and Design				
7.	What is Research Problem?	1	T1	Experimental designs. Developing research plan.
8.	Selecting the Problem	1	T1	
9.	Necessity of Defining the Problem	1	T1	
10.	Techniques involved in Defining a Problem	2	T1	
11.	What is Research Design? Its need and features	1	T1	
12.	Important concepts of Research Design	1	T1	
13.	Designing Methods: Research design in case of exploratory research studies, Research design in case of descriptive and diagnostic research studies, Research design in case of hypothesis-testing research studies	2	T1	
	Total of periods required:	**9**		
Unit-III: Data Collection, Analysis, and Hypothesis				
14.	Collection of Primary Data: Observation Method, Interview Method, Questionnaires,Schedules, Other Methods	1	T1	Guidelines for constructing questionnaires and interviews.
15.	Collection of Secondary Data	1	T1	
16.	Selection of Appropriate Method for Data Collection	1	T1	
17.	Processing Operations: Editing, Coding, Classification and Tabulation	2	T1	
18.	Types of Analysis	1	T1	
19.	What is Hypothesis? Basic Concepts of Testing Hypothesis:Null hypothesis and alternative hypothesis,Level of significance, Decision rule, Type I and Type II errors, Two-tailed and One-tailed tests	2	T1	
20.	Hypothesis Testing Procedure	1	T1	
	Total of periods required:	**9**		

Unit-IV: Statistics in Research				
21.	Review of Statistical Techniques: Mean, Median, Mode	1	T1	Simple regression analysis.
22.	Geometric Mean, Harmonic Mean, Variance, Standard Deviation	1	T1	
23.	Measure of Asymmetry	1	T1	
24.	Normal Distribution	2		
25.	Chi-Square as a Test for Comparing Variance	1	T1	
26.	Steps Involved in Applying Chi-Square Test	1	T1	
27.	Problems	2		
	Total of periods required:	**9**		
Unit-V: Interpretation and Report Writing				
28.	Interpretation: Meaning, Importance	1	T1	Mechanics of writing research report.
29.	Interpretation: Techniques and Precautions	1	T1	
30.	Report Writing: Significance and Different Steps	2	T1	
31.	Types of Reports	1	T1	
32.	Precautions in Report Writing	1	T1	
	Total of periods required:	**6**		
	Grand total of periods required:	**40**		

TEXT BOOK:

T1. C.R. Kothari, *Research Methodology: Methods and Techniques*, New Age International Publishers, New Delhi, 2nd Revised Edition, 2004.

REFERENCES:

R1. Ranjit Kumar, *Research Methodology: A step-by-step guide for beginners*, Sage South Asia, 3rd ed., 2011.

R2. R. Panneerselvam, *Research Methodology*, PHI learning Pvt. Ltd., 2009

Signature of the faculty Member framing the syllabus

Signature of the Chairman (BOS)