

**VII - SEM. ELECTRICAL ENGG.**

SEM	SUB CODE	SUBJECT NAME	BOARD	L	T	P	HRS. PER WEEK	MAX. MARKS THEORY	PAPER	COLL. ASSES.	MAX. MARKS PRACT	PAPER	COLL. ASSES.	PAPER DURATION
7	7S-EE-01	CONTROL SYSTEM-II	EE	4	1	0	5	100	80	20				3 Hrs.
7	7S-EE-02	ELECTRICAL POWER - II	EE	4	1	0	5	100	80	20				3 Hrs.
7	7S-EE-03	ELECTIVE -I	EE	3	1	0	4	100	80	20				3 Hrs.
7	7S-EE-04	HIGH VOLTAGE ENGG.	EE	4	1	2	7	100	80	20	50	25	25	3 Hrs.
7	7S-EE-05	POWER ELECTRONICS	EE	4	1	2	7	100	80	20	50	25	25	3 Hrs.
7	7SEE-06	PROJECT SEMINAR		0	0	3	3				50		50	
		TOTAL CREDIT POINT= 19+2.5+3.5=25		19	5	7	31		500			150		TOTAL MARKS=650

**VIII - SEM. ELECTRICAL ENGG.**

SEM	SUB CODE	SUBJECT NAME	BOARD	L	T	P	HRS. PER WEEK	MAX. MARKS THEORY	PAPER	COLL. ASSES.	MAX. MARKS PRACT	PAPER	COLL. ASSES.	PAPER DURATION
8	8S-EE-01	POWER SEMICONDUCTOR BASED	EE	4	1	0	5	100	80	20				3 Hrs.
8	8S-EE-02	ELECTIVE- 2	EE	3	1	0	4	100	80	20				3 Hrs.
8	8S-EE-03	SWITCHGEAR & PROTECTION	EE	4	1	2	7	100	80	20	50	25	25	3 Hrs.
8	8S-EE-04	COMP.APPL.IN ELECTRICAL ENGG.	EE	4	1	2	7	100	80	20	50	25	25	3 Hrs.
8	8S-EE-05	PROJECT		0	0	6	6				150	25	25	3 Hrs.
		TOTAL CREDIT POINT= 15+2+5=22		15	4	10	29		400			250		TOTAL MARKS=650

## SEVENTH SEM B.E. ELECTRICAL

### CONTROL SYSTEMS -II

7S-EE-01

UNIT - 1

**COMPENSATION:** Review of performance Analysis of type 0, type 1 & type 2 systems. Need for compensation. Performance Analysis of Compensators in time & frequency domain, Bode Plots. Design of Compensators is not required.

UNIT-2

**DESIGN BY STATE VARIABLE FEEDBACK:** Review of state variable representations. Solution of state equation. Controllability & Observability. Design by State Variable Feedback.

UNIT-3

**OPTIMAL CONTROL SYSTEM:** Performance Index. Desirability of single P.I., Integral square error, parameter optimization with & without constraints. Optimal control problem with T.F. approach for continuous time system only.

UNIT-4

**NON LINEAR CONTROL SYSTEMS:** Types of non - linearities. Characteristics of NLCS. Inherent & intentional non- linearities. Describing function method for Analysis. Describing function of some common non- linearities. Stability analysis. Limit cycles & stability of limit cycles.

UNIT-5

**PHASE PLANE METHOD:** Singular points. Stability from nature of singular points. Construction of trajectory by Isoclines & Delta method, Computation of time.

UNIT-6

**SAMPLED DATA CONTROL SYSTEMS:** Representation SDCS, Sample & Hold circuit. Z-Transform. Inverse Z- Transform & solution of difference equations. 'Z' & 'S' domain relationship. Stability by Bi-linear transformation & Jury's test. Discretization of continuous time state equation. Solution of Discrete time state equations. Controllability & Observability of Discrete time systems.

BOOKS :

1. Control System Analysis by Nagrath & Gopal (New Age International Pvt. Ltd.)
2. Linear System Analysis by D' Azzo & Houpis (McGraw Hill)
3. Modern Control Engineering by Ogata. (Prentice Hall)
4. Modern Control Theory by M Gopal. (Wiley Eastern)



- UNIT 1: SYMMETRICAL COMPONENT TRANSFORMATION:** Three phase power in unbalanced circuit in terms of symmetrical component. Sequence impedances of Generator. Transformer Transmission line & Passive loads. Phase shift in star / delta three-phase transformer (Y d1, Y d11 connection.).
- UNIT 2: SYMMETRICAL FAULT ANALYSIS:** Without & \with prefault load current. Selection of Circuit Breakers ratings, current limiting reactors.
- UNIT 3: UNSYMMETRICAL FAULT ANALYSIS:** L-G, L-L-G, L-L, open conductors faults analysis using symmetrical components.
- UNIT 4: STABILITY OF POWER SYSTEM-** Steady state, Dynamic and Transient stability definition. Dynamics of synchronous machine, swing equation, swing equation for machines swinging coherently and Non-Coherently. Power angle equation. Steady state stability studies.  
**TRANSIENT STABILITY STUDIES:** -  
 Swing curve. Equal Area criterion for transient stability. Application of equal area criterion for different disturbances. Solution of swing equation by point-by-point method. Methods of improving transient stability.
- UNIT 5: ECONOMIC OPERATION OF POWER SYSTEM:** Introduction, Distribution of load between units within the plant Optimum generation scheduling considering transmission losses. Representation of transmission loss using loss formula coefficient. Derivation of loss formula co-efficient, simulation of co-ordination equation on digital computer.
- UNIT 6:** i) **GROUNDING OF NEUTRAL** in power system.  
 ii) **SHUNT & SERIES COMPENSATION**-Generalized equation, shunt reactor compensation of very long line with intermediate switching station, series capacitor compensation at line center, shunt reactors at both ends and series capacitor in middle of line. Elementary idea of sub synchronous resonance problem and counter measures.

## Books:

1. Elements of Power System Analysis by Stevenson (MGH)
2. Modern power System analysis by I.J. Nagrath & D.P.Kothari (MGH)
3. Electrical Power System Analysis by Wadhwa C.L. (New Age International)
4. Extra High Voltage AC. Transmission Engineering by R D. Begamudre.

Note: - Unit 6 (ii) - Scope will be limited to the treatment given in recommended Book (4).