

COURSE NAME : DIPLOMA IN ELECTRICAL POWER SYSTEM
COURSE CODE : EP
SEMESTER : SIXTH
SUBJECT TITLE : POWER SYSTEM OPERATION & LOAD DISPATCH EP
SUBJECT CODE : 9148

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme						
TH	TU	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
03	--	02	03	80	20	--	25#	25@	150

Rationale:

Power System Engineer will play an important role in operation of power system, which is large in size & complex in nature. Hence the knowledge of operational analysis & system stability is essential.

For learning this subject, knowledge of power generation, transmission & distribution system, switch gears, protection schemes & utilization is required.

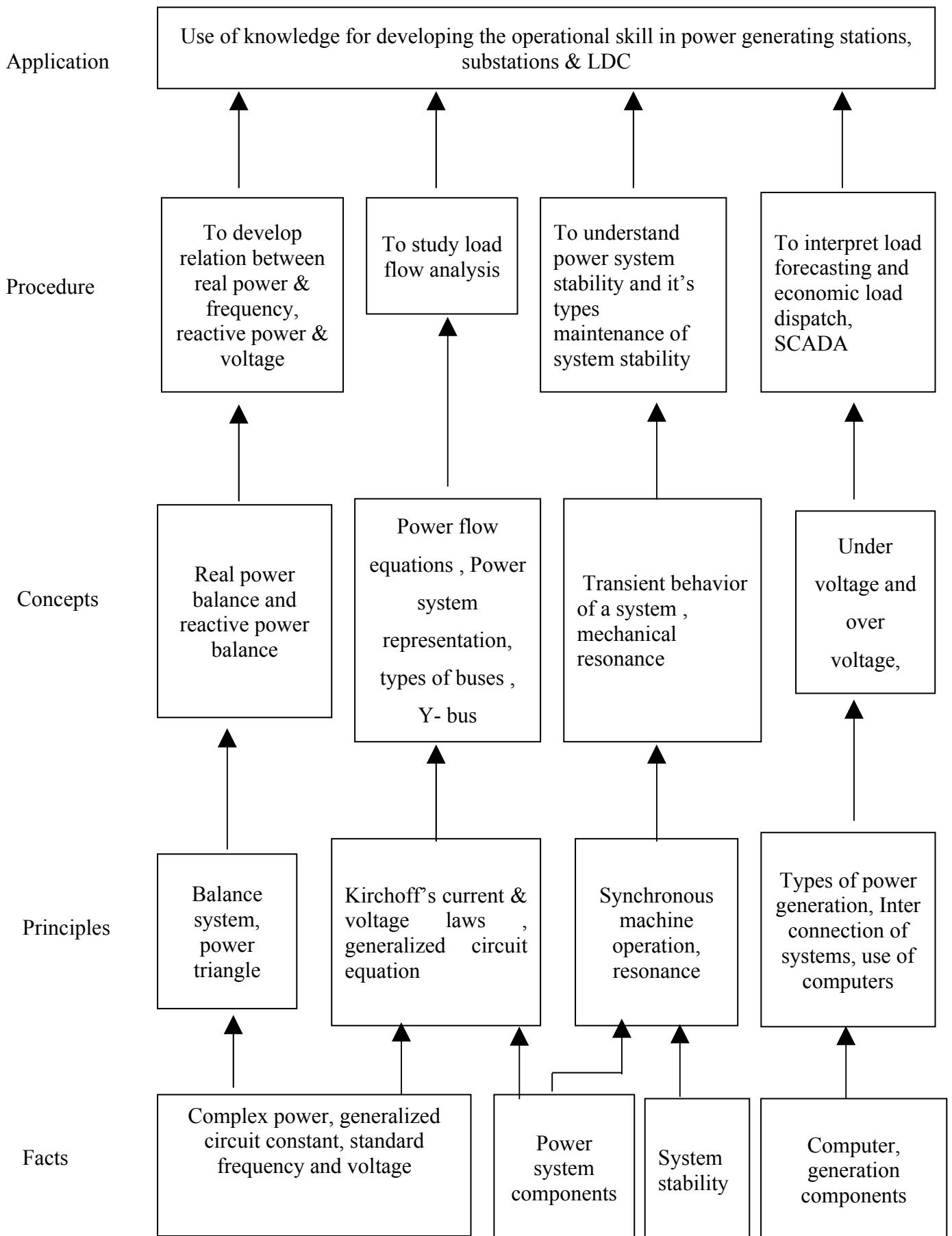
This subject deals with cause of change in frequency & change in voltage & also automatic excitation & governor control for maintenance of power system stability.

Objectives:

Students will be able to:

1. Appreciate the significance of real power & reactive power flow in the system.
2. Identify the causes of Power Failure
3. Describe the importance of system stability.
4. Describe concept of load flow analysis.
5. Write Y – bus vector configuration.
6. Explain function & Operation of load dispatch center.

Learning Structure:



Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	Real & Reactive power flow control 1.1 Review of power flow in power system 1.1.1 Types of consumers. 1.1.2 Types of power plants. 1.2 Generation & Load balance 1.2.1 Real power flow balance 1.3 Real power & frequency dependence 1.3.1 Derive relation for a simple 2-bus system. 1.3.2 Effect of change in frequency on various consumers. 1.3.3 Effect of change in frequency in utilities. 1.3.4 Load frequency control. 1.3.5 Schematic diagram of load frequency control of Turbo generator. 1.3.6 Turbine speed governing system (AGC) (automatic frequency control using primary & secondary loops. 1.4 Reactive power & voltage dependence. 1.4.1 Derive relation for simple 2-bus system. 1.4.2 Effect of change in voltage. 1.4.3 Automatic Excitation control. 1.4.4 Concept of Reactive power compensation. 1.4.5 Types of Reactive power compensating equipments and their field of application.	10	14
02	Load Flow Analysis 2.1 Need of load flow analysis 2.2 Important Aspects of load flow analysis 2.3 Data required for load flow analysis 2.4 Classification of bus, formation of Y-bus 2.5 Derivation of SLFE equation for a simple Two Bus system 2.6 Numerical for 3 bus system including reference bus (for formation of Y_{bus}) 2.7 Characteristics of SLFE 2.8 Information obtained from SLFE 2.9 Constraints of SLEF	12	26

03	<p>Power System Stability</p> <p>3.1 Introduction</p> <p>3.1.1 Causes of disturbance in power system</p> <p>3.1.2 Condition & necessity of synchronization of alternators.</p> <p>3.1.3 Need of interconnection of power system network</p> <p>3.1.4 Concept of stability with reference to synchronous machine operation.</p> <p>3.2 Power angle curve</p> <p>3.3 Types of stability</p> <p>3.3.1 Steady state stability</p> <p>3.3.2 Derivation of maximum steady state power flow & condition.</p> <p>3.4 Transient state stability</p> <p>3.4.1 Causes</p> <p>3.4.2 Representation in power angle diagram</p> <p>3.4.3 Techniques for improving transient stability (conceptual level only)</p> <p>3.5 Concept of dynamic state stability & its effect (No Numerical)</p>	12	20
04	<p>Concept of load dispatching</p> <p>4.1 Schematic of regional interconnected grids in India</p> <p>4.2 Types of LDS & their significance</p> <p>4.3 Functions of LDS</p> <p>4.3.1 Load forecasting</p> <p>4.3.1.1 Need of forecasting</p> <p>4.3.1.2 Planning tools</p> <p>4.3.1.3 Forecasting based on load curves</p> <p>4.3.1.4 Environmental & social factors in load forecasting</p> <p>4.3.2 Load shedding</p> <p>4.3.2.1 What is load shedding & its governing factors.</p> <p>4.4 SCADA</p> <p>4.4.1 Components & their functions</p> <p>4.4.2 Applications of SCADA at LDS</p>	10	16
05	<p>Optimum operating strategy</p> <p>5.1 Generation mix</p> <p>5.2 Optimum dispatch</p> <p>5.3 Economic dispatch</p> <p>5.3.1 Cost function</p> <p>5.3.2 Generator operating cost</p> <p>5.3.3 Optimal operation (Numerical)</p> <p>5.3.4 Distribution of load within the plant & between the plants (simple numerical) No derivation on above topics</p>	04	04
Total		48	80

Practical:

Skills to be developed:

Intellectual Skills:

1. Knowledge Recalling Skill
2. Identification Skill
3. Interpretation Skill
4. Planning Skill
5. Information Searching skill

Motor Skills:

1. Drawing Skill

Assignments:

01	<p>Visit To Power Plant & Report Writing</p> <ul style="list-style-type: none"> • Draw schematic diagram & layout. • Write different components of power plant & their functions. • Describe different controls in operation of power plant like AGC/frequency control/voltage control. • Study different disturbances in the station & how system can be restored. • Study different types of stability.
02	<p>Visit to load dispatch station & report writing</p> <ul style="list-style-type: none"> • Study different components of LDS. • Study and operation of SCADA. • Study control of real & reactive power in LDS on monitor (online). • Understand the effect of load shedding through single line diagram on monitor. • Analyze the incentive & penalty for the change of frequency.
03	<p>Load flow analysis (practical session for numerical)</p> <ul style="list-style-type: none"> • Take suitable examples on – <ul style="list-style-type: none"> ○ Study of simple three bus system. ○ Formation of Y- bus. ○ SLFE equations.
04	<p>Study Of Different Equipments Of Voltage Control</p> <ul style="list-style-type: none"> • Draw diagrams of equipments. • Describe working of them.
05	<p>Study of different Reactive power compensating equipments</p> <ul style="list-style-type: none"> • Draw diagram & describe working of each. • Case study of some industry in which these equipments are installed. • Study the improvement in p.f. in above industry equipments by reactive power compensation.
06	<p>Study different Tariffs & collect information about it & write a report on different Tariff structures.</p>
07	<p>Collect seminar papers on any topic related to subject given by experts in conferences or published in journals / magazines & write brief report on it.</p>

Learning Resources:**Books:**

Sr. No.	Author	Title	Publication & Address
01.	I. J. Nagrath & D. P. Kothari	Power system Engineering	Tata McGraw Hill Publication
02.	A. S. Pabla	Electrical Power system Planning	Macmillan India Ltd. New Delhi
03.	Olle. L. Elgerd	Electrical Energy System	Tata McGraw Hill Publication
04.	John J. Graninger & Wiliam StevensonJR	Power system Analysis	Tata McGraw Hill Publication
05.	Wiliam Stevenson	Elements Power system Analysis	McGraw Hill Bork company