

Course Title	Flexible AC Transmission Systems
Course Code	EPS102
Course Credit	Lecture : 03
	Practical : 00
	Tutorial : 01
	Total : 04

Course Objective

The objective of the course is:

To enable the students acquire a comprehensive ideas on various aspects of FACTS systems. To acquire the knowledge on Flexible AC Transmission System and its importance for FACTS devices. To understand the various FACTS controllers operation on FACTS systems. To Gain Knowledge about STATCOM

Detailed Syllabus

Sr. No.	Name of chapter & Details	Hours Allotted
Section – I		
1	Introduction: Background, Electrical Transmission Networks, Conventional Control Mechanisms, Flexible ac Transmission Systems (FACTS), Emerging Transmission Networks	5
2	Reactive-Power Control in Electrical Power Transmission Systems: Reactive Power, Uncompensated Transmission Lines, Passive Compensation	6
3	Principles of Conventional Reactive-Power Compensators: Synchronous Condensers, The Saturated Reactor (SR), The Thyristor - Controlled Reactor (TCR), The Thyristor-Controlled Transformer (TCT), The Fixed Capacitor-Thyristor-Controlled Reactor (FC-TCR), The Mechanically Switched Capacitor-Thyristor-Controlled Reactor (MSC-TCR), The Thyristor-Switched capacitor and Reactor, The Thyristor-Switched capacitor-Thyristor-Controlled Reactor (TSC-TCR), A Comparison of Different SVCs, Summary	10
4	SVC Control Components and Models: Measurement Systems, The Voltage Regulator, Gate-Pulse Generation, The Synchronizing System, Additional Control and Protection Functions Modeling of SVC for Power-System Studies	5
Section – II		
5	STATCOM: Introduction to Unified Power Flow Controller (UPFC) and Interline Power Flow Controller (IPFC), Basic operating principles and control	6

	structure of UPFC, Introduction to sub synchronous resonance, NGH – SSR damping scheme	
6	Emerging FACTS Controllers: THE SSSC, The UPFC, Comparative Evaluation of Different FACTS Controllers, Future Direction of FACTS Technology.	6
7	Applications: Increase in Steady-State Power-Transfer Capacity, Enhancement of Transient Stability, Augmentation of Power-System Damping, SVC, Mitigation of Subsynchronous Resonance (SSR), Prevention of Voltage Instability, Future Direction of FACTS Technology	6
8	The Thyristor-Controlled Series Capacitor (TCSC): Series Compensation, The TCSC Controller, Operation of the TCSC, The TSSC, Analysis of the TCSC, Capability Characteristics, Harmonic Performance, Losses, Response of the TCSC, Modeling of the TCSC, Open-Loop Control, Closed-Loop Control, Improvement of the System-Stability Limit, Enhancement of System Damping, Sub synchronous, Resonance (SSR) Mitigation, Voltage-Collapse Prevention, TCSC Installations	8

Instructional Method and Pedagogy:

- Lectures will be conducted with the aid of multi-media projector, black board, Transparencies etc.
- Assignments and Exercise will be given to the students for each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar/Tutorials will be conducted.
- Self study assignments, seminar from students can be conducted

Students Learning Outcomes:

At the end of the course students will be able

- To acquire the knowledge on Flexible AC Transmission System and its importance for FACTS devices.
- To understand the various FACTS controllers operation on FACTS systems.

Reference Books/Text book:

1. Thyristor-based FACTS controllers for Electrical Transmission Systems : R Mohan Mathur, R K Verma, Wiley IEEE Press
2. Understanding FACTS, N.G.Hingorani and L.Gyugyi, Standard Publishers, Delhi, 2001
3. Power System Stability and Control, Prabha Kundur, Tata McGrahill.
4. Reactive Power Control in Electric Systems: T J E Miller, John Willey

Additional Resources:

www.sciencedirect.com
www.delnet.nic.in