M.E Semester: 2
Electrical Engineering (Electrical Power System)
Subject Name: Flexible AC Transmission System

A. Course Objective:

- To review detail concepts of power System in the field of power Transmission.
- To address the underlying concepts and methods behind Advanced Power Systems.
- To impart knowledge of power System technologies and their advancement in the field of power conversion.

B. Teaching / Examination Scheme

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
MEEPS-201	Flexible AC Transmission System	4	0	2	6	5	3	70	30	20	30	150

C. Detailed Syllabus

SR No.	Unit No	Topic	No. of Hours	Weightage In Exam.
1	**Unit:1**	**Introduction:** Background., Electrical Transmission Networks., Conventional Control , Mechanisms., Flexible ac Transmission Systems (FACTS), Emerging Transmission Networks, Reactive Power, Uncompensated Transmission Lines, Passive Compensation	06	10%
2	**Unit:2**	**Conventional Reactive-Power Compensators:** Synchronous Condensers , The Saturated Reactor (SR) , The Thyristor-Controlled Reactor (TCR) , The Thyristor-Controlled Transformer (TCT), Thristor-Controlled Reactor (MSC-TCR) , ,The Thyristor-Switched capacitor-Thyristor-Controlled Reactor (TSC-TCR).	12	20%
3	**Unit:3**	**SVC Voltage Control:** Voltage Control, Effect of Network Resonances on the Controller Response, The 2nd Harmonic Interaction between the SVC and ac Network, Application of the SVC to Series-Compensated ac Systems, 3rd Harmonic Distortion, Voltage-Controlled Design Studies, Measurement Systems ,	12	20%

4	**Unit:4**	**Series Compensators:** Series Compensation, Fixed Series Compensation, Static Synchronous Series Compensators and TCSC, The TCSC Controller, Operation of the SSSC & TCSC, Analysis of the TCSC & SSSC, Capability Characteristics, Harmonic Performance, Losses. Modeling of the TCSC & SSSC, Unified Power Flow Controller (UPFC), Analysis of UPFC.	20	30%
5	**Unit:5**	**Emerging FACTS Controllers** The STATCOM, D-Statcom, Distributed Voltage Regulators, The SSSC, Comparative Evaluation of Different FACTS Controllers, Future Direction of FACTS Technology.	10	20%

D. Instructional Methods

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- Two internal exams may be conducted and average of the same may be converted to equivalent of 15 marks as a part of internal theory evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of five marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

E. Students Learning Outcomes

- Students should be able to understand role of reactive power control and basics of FACTS.

F. Recommended Study Materials

- **Text & Reference Books:**

1. Understanding FACTS, N.G.Hingorani and L.Gyugyi, Standard Publishers, Delhi, 2001
2. FACTS Controllers in Power Transmission & Distribution: Padiyar K R, New Age International (P) Limited.
3. Reactive Power Control in Electric Systems: T J E Miller, John Willey
4. Power System Stability and Control, PrabhaKundur, Tata McGrahill
5. Thyristor-based FACTS controllers for Electrical Transmission System : R. Mohan Mathur, R K Verma, Wiley IEEE Press

