

## **EE 521: FACTS CONTROLLER (3-0-0: 3)**

### **Introduction to Flexible Alternating Current Transmission System (FACTS)**

Fundamentals of ac power transmission, transmission problems and needs, Emergence and advantages of FACTS technology in transmission system, Types of FACTS controller, Application of FACTS controllers in Distribution System

### **Power Flow Control Concepts**

Theory and implementation of Power Flow Control Concepts, Analysis of uncompensated AC Transmission line, Passive reactive power compensation: Effect of series and shunt compensation at the mid-point of the line on power transfer

### **Voltage-Sourced Converters**

Basic concept of voltage-sourced converters, single and three phase bridge converters, Introduction to power factor control, Transformer connections for 12- pulse, 24 pulse and 48 pulse operations, VSC based FACTS controllers

### **Static VAR Compensation**

Analysis of SVC, Configuration of SVC, SVC Controller, Voltage Regulator Design, Harmonics and Filtering, Protection Aspects, Modelling of SVC, Application of SVC

### **Shunt Compensation**

Principles of shunt compensation, Variable Impedance type & switching converter type-Static Synchronous Compensator (STATCOM) configuration, characteristics and control

### **Series Compensation**

Basic concepts of controlled series compensation, Principles and operation of static series compensation using GCSC, TCSC and TSSC, applications, Static Synchronous Series Compensator (SSSC)

### **Static Voltage and Phase Angle Regulators**

Principles of operation-Steady state model and characteristics of a static voltage regulators and phase shifters-power circuit configurations, Power-flow control and improvement of stability by phase angle regulator, Introduction to Thyristor Controlled Voltage and Phase Angle Regulators (TCVR and TCPAR)

### **UPFC& IPFC**

Principles of operation and characteristics, independent active and reactive power flow control, comparison of UPFC with the controlled series compensators and phase shifters, Applications of UPFC. Interline Power Flow Controller (IPFC), basic operating principles and characteristics, Applications of IPFC

### **Text Books and References**

1. K.R.Padiyar, "FACTS controllers for transmission and Distribution systems", New Age international Publishers.
2. Y.H. Song and A. T. Johns, "Flexible ac transmission systems (FACTS)", Institution of Electrical Engineers Press, London.
3. R. M. Mathur and R. K.Varma, "Thyristor - based FACTS controllers for Electrical transmission systems", IEEE press, Wiley Inter science.