

# GUJARAT TECHNOLOGICAL UNIVERSITY

## Power Electronics

### M.E. Semester: II

Subject Name: **Power Electronics Applications to Power System**  
(Major Elective –II)

Sr. No.	Course Content
1.	<b>Introduction:</b> Reactive power transmission and associated difficulties, power system components model, formation of bus admittance matrix, Transmission line model and loadability, models of OLTC phase shifting Transformer, Load flow study, Electrical Transmission Networks, Conventional Control, Mechanisms, Flexible ac Transmission Systems (FACTS), Emerging, Transmission Networks.
2.	<b>Voltage Stability:</b> proximity indicators, minimum eigen value of reduced load flow jacobians, participation factors, modal analysis
3.	Conventional Reactive -Power Compensators, Synchronous Condensers , The Saturated Reactor , The Thyristor-Controlled Reactor , The Thyristor-Controlled Transformer, The Fixed Capacitor-Thyristor-Controlled Reactor , The Mechanically Switched Capacitor-Thyristor-Controlled Reactor , The Thyristor-Switched capacitor and Reactor, The Thyristor-Switched capacitor-Thyristor-Controlled Reactor , A Comparison of Different SVCs, Summary
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.	Concepts of 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, 3 <sup>rd</sup> Harmonic Distortion, Voltage-Controlled Design Studies
6.	<b>Applications:</b> 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
7.	<b>The Thyristor-Controlled Series Capacitor, 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</b>

8.	TCSC Applications, 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
9.	Emerging FACTS Controllers The STATCOM, THE SSSC, The UPFC, Comparative Evaluation of Different FACTS Controllers, Future Direction of FACTS Technology

### **Reference Books:**

1. K.R. Padiyar, 'FACTS controllers in power transmission and distribution', New Age International, 2007.
2. V. K. Sood, "HVDC and FACTS controllers-Applications of static converters in power systems", kluwer academic publisher
3. N. G. Hingorani, et.al., " Understanding of FACTS", IEEE Press
4. P. Kundur, " Power System Stability and control" IEEE Press