

FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS

Group - V								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AEE524	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
<p>OBJECTIVES: The course should enable the students to:</p> <ol style="list-style-type: none"> I. Describe the effect of series and shunt compensation using various FACTS controllers. II. Static VAR compensator for voltage regulation and transient stability enhancement of system. III. Analyse voltage source converter based FACTS controllers and their coordination. <p>COURSE OUTCOMES (COs):</p> <p>CO1: Understand the fundamentals of FACTS controllers and their role in improving power system performance CO2: Understand SVC for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping CO3: Analyse the use of control schemes of TCSC, TSSC, GSC in improving the power quality. CO4: Analyse the applications of Voltage Source Converter based FACTS Controllers CO5: Explain the FACTS Controllers and their co-ordination</p> <p>COURSE LEARNING OUTCOMES (CLOs)</p> <p>At the end of the course, the student will have the ability to:</p> <ol style="list-style-type: none"> 1. Discuss about the introduction of FACTS technology in Power Systems and power flow in transmission lines 2. Discuss about the Reactive Power Compensation in Transmission line and also the types of Compensation methods 3. Explain the need of FACTS and types of FACTS Controllers. 4. Discuss about the Static VAR Compensator, its configuration and Voltage Regulation 5. Study the modelling of SVC for Stability and for Load flow analysis 6. Designing of SVC to regulate transient stability enhancement and power oscillation damping 7. Understanding the concepts Controlled Series Capacitors 8. Explain the operation, analysis and gate turn off characteristics of Thyristor Controlled Series Capacitor 9. Modeling of TCSC and GCSC for Stability and for Load flow analysis 10. Operation of Static Synchronous Compensator(STATCOM) and Synchronous Series Compensator(SSSC) 11. Modeling of Static Synchronous Compensator (STATCOM) and Synchronous Series Compensator (SSSC) Transient Stability and for Power Flow analysis. 12. Modeling of UPFC and IPFC for Transient Stability and for Power Flow analysis 13. Discuss about FACTS controller interactions 14. Explain SVC interaction, co- ordination of multiple controllers using linear control techniques 								

15. Explain the quantitative treatment of control co ordination
 16. Explore the knowledge and skills of employability to succeed in national and international

UNIT - I	INTRODUCTION	Classes: 08
<p>FACTS Controllers: Review of basics of power transmission networks, control of power flow in AC transmission line, analysis of uncompensated AC transmission line, passive reactive power compensation, effect of series and shunt compensation at the midpoint of the line on power transfer, need for FACTS controllers, types of FACTS controllers.</p>		
UNIT - II	STATIC VAR COMPENSATOR (SVC)	Classes: 10
<p>Static VAR compensator: Configuration of static VAR compensator, voltage regulation by static VAR compensator, modeling of static VAR compensator for load flow analysis, modeling of static VAR compensator for stability studies, design of static VAR compensator to regulate the midpoint voltage of SMIB system, applications, transient stability enhancement and power oscillation damping of single machine infinite bus system with static VAR compensator connected at the midpoint of the line.</p>		
UNIT - III	THYRISTOR AND GTO THYRISTOR CONTROLLED SERIES CAPACITORS (TCSC and GCSC)	Classes: 09
<p>Series compensator: Concepts of controlled series compensation, operation of thyristor controlled series capacitor and gate turn off thyristor controlled series capacitor, analysis of TCSC.</p> <p>GCSC modeling of TCSC and GCSC for load flow studies, modeling TCSC and GCSC for stability studies, applications of TCSC and GCSC.</p>		
UNIT - IV	VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS	Classes: 10
<p>Static synchronous compensator (STATCOM), static synchronous series compensator (SSSC), operation of STATCOM and SSSC power flow control with STATCOM and SSSC, modeling of STATCOM and SSSC for power flow and transient stability studies, operation of unified and interline power flow controllers (UPFC and IPFC) modeling of UPFC and IPFC for load flow and transient stability studies, applications.</p>		
UNIT - V	CONTROLLERS AND THEIR COORDINATION	Classes: 08
<p>FACTS controller interactions: SVC, SVC interaction, co ordination of multiple controllers using linear control techniques, quantitative treatment of control co ordination.</p>		
Text Books:		

1. Mohan Mathur, R Rajiv K Varma, “Thyristor – Based FACTS controllers for Electrical Transmission Systems”, IEEE press and John Wiley & Sons, 1st Edition, 2002.
2. K R Padiyar,” FACTS Controllers in Power Transmission and Distribution”, New Age International (P) Ltd., Publishers, 1st Edition, 2008.
3. A T John, “Flexible AC Transmission System”, Institution of Electrical and Electronic Engineers (IEEE), 2nd Edition, 1999

Reference Books:

1. Narain G Hingorani, Laszlo Gyugyl, “Understanding FACTS Concepts and Technology of Flexible AC Transmission System”, Standard Publishers, 1st Edition, 2001.
2. K Sood, “HVDC and FACTS controllers - Applications of Static Converters in Power System”, Kluwer Academic Publishers, 1st Edition, 2004.

Web References:

1. <https://www.researchgate.net>
2. <https://www.aar.faculty.asu.edu/classes>
3. <https://www.facstaff.bucknell.edu/>
4. <https://www.electrical4u.com>
5. <https://www.iare.ac.in>

E-Text Books:

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>

Course Home Page: