

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC SEMESTER : VII

ELECTRICAL ENGINEERING

Subject Name: **ADVANCED POWER SYSTEM-I**

Sr. No.	Course Contents	Total Hrs
1.	Introduction: 1.1 Background 1.2 Electrical Transmission Networks 1.3 Conventional Control Mechanisms 1.3.1 Automatic Generation Control (AGC) 1.3.2 Excitation Control 1.3.3 Transformer Tap-Changer Control 1.3.4 Phase Shifting Transformers 1.4 Flexible ac Transmission Systems (FACTS) 1.4.1 Advances in power Electronics Switching Devices 1.4.2 Principles and Applications of Semiconductor Switches 1.5 Emerging Transmission Networks	06
2.	Reactive Power Control in Electrical Power Transmission Systems 2.1 Reactive Power 2.2 Uncompensated Transmission Lines 2.2.1 A simple Case 2.2.2 Lossless Distributed Parameter Lines 2.3 Passive Compensation 2.3.1 Shunt Compensation 2.3.2 Series Compensation 2.3.3 Effect on power-Transfer Capacity 2.3.3.1 Series Compensation 2.3.3.2 Shunt Compensation	06
3.	Principles of Conventional Reactive Power Compensators 3.1 Introduction 3.2 Synchronous Condensors 3.2.1 Configuration 3.2.2 Applications 3.3 The saturated Reactor 3.4 Thyristor Controlled Reactor(TCR) 3.4.1 The single phase TCR 3.4.2 The three phase TCR 3.4.4 The segmented TCR 3.4.5 The 12-Pulse TCR	08
4.	HVDC Transmission-Development 4.1 Introduction 4.2 Historical Development 4.3 Equipment required for HVDC System 4.4 Comparison of AC and DC transmission 4.5 Limitation of HVDC Transmission Lines 4.6 Reliability of HVDC Systems 4.7 Standard Rated Voltages of HVDC and EHV AC systems 4.8 Choice of EHV AC and UHV AC lines and substation 4.9 Comparison of HVDC link with EHV AC link 4.10 HVDC-VSC Transmission System	06

5.	HVDC Convertors 5.1 Introduction 5.2 Insulated Gate Bipolar Transistor (IGBT) 5.3 HVDC Converter Valve and Valve Assembly 5.4 HVDC –VSC Operation and Principles 5.5 Three Phase Six Pulse Converter using SCRs 5.6 Twelve Pulse Bridge Converters	
6.	Six Pulse Converter Operation and Analysis 6.1 Introduction 6.2 Conduction Sequence in Six Pulse Converter 6.3 Ideal Commutation Process without Gate control 6.4 DC output Voltage 6.5 Gate control of valve 6.6 Analysis of Voltage Waveform with overlap angle 6.7 Voltage dropped in PU Quantities 6.8 Complete Characteristics Of converter as Rectifier /Inverter 6.9 Analysis of Twelve Pulse Converter 6.10 Power flow in HVDC Link	06
7.	Control of HVDC converter and system 7.1 Introduction 7.2 Mechanism of AC power Transmission 7.3 Principles of Control 7.4 Necessity of Control in case of DC link 7.5 Rectifier Control 7.6 Compounding Of Rectifier 7.7 Power Reversal in DC link 7.8 Voltage Dependent Current Order Limit- Characteristics of Converter 7.9 System Control Hierarchy and Basic Philosophy 7.10 Inverter Extinction Angle Control (EAG)	06
8.	Harmonics in HVDC Systems 8.1 Introduction 8.2 Importance of Harmonic Study 8.3 Generation of Harmonics by Converters 8.4 Characteristics Harmonics on the DC Side 8.5 Characteristics Current Harmonics	04

Text Books:

1. Thyristor-Based FACTS Controllers for Electrical Transmission Systems-R.M.Mathur/
R.K.Verma, John Wiley & Sons, Inc., 2002
2. Power System Stability and Control – Prabha Kundur, Mc Graw Hill, ISBN: 9780070635159
3. N. Hingorani, L. Gyugyi, Understanding FACTS: Concepts and Technology of Flexible AC
transmission Systems, Delhi Publishers, ISBN-13: 9788186308790
4. HVDC Transmission: S Kamakshaiah, V Kamaraju , McGrawHill, ISBN: 978007107253