22EEHO109	HIGH VOLTAGE INSULATION SYSTEMS		SEMESTER			
PREREQUISTIES		CATEGORY	PEC	Credit		C
High voltage Engineering, Measurements and Instrumentation		Hours\Week	L	T	P	TH
			3	0	0	3

Course Objectives:

1.	To expose the various types of insulating materials used for power system equipment
2.	To introduce the concept of insulation design.
3.	To provide an overview of insulation defects in power system equipment
4.	To understand insulation condition monitoring techniques.

UNIT I	INSULATING MATERIALS	9	0	0	9

Review of electrical insulating materials, characterization of insulation condition, models of deterioration and failure of practical insulating materials, electrical breakdown and operating stresses, development of insulation applications

UNIT II	ELECTRICAL INSULATION DESIGN CONCEPTS	9	0	0	9

Overview of insulation design requirements – electrical stress distribution in simple insulation system – electric stress control: Principles of stress control, Stress distribution in multiple dielectrics, Stress calculation.

UNIT III	INSULATION DEFECTS IN HV POWER SYSTEM EQUIPMENTS	9	0	0	9

HV Insulators - HV bushings - HV power capacitors - HV surge arresters – HV circuit breakers, HV Cables - Gas Insulated system – HV Transformers - HV instrument transformers.

UNIT IV	BASIC METHODS FOR INSULATION ASSESSMENT	9	0	0	9

Generation and measurement of test high voltages - Non-destructive electrical measurements: Insulation Resistance, dielectric dissipation factor, partial discharges, dielectric response – Physical and chemical diagnostic methods.

UNIT V	ONLINE INSULATION CONDITION MONITORING TECHNIQUES	9	0	0	9

Main problem with Offline condition monitoring - Noise-mitigation techniques - Non-electrical online condition monitoring - Online acoustic/electric PD location methods for transformers - Electrical online condition monitoring.

Total (45L+0T)= 45 Periods

Text Books:

1.	R. E. James and Q. Su, "Condition Assessment of High Voltage Insulation in Power System Equipment", IET power and Energy Series Publisher, London, United Kingdom, 2008.

Reference Books:

1.	Dieter Kind and Hermann Kärner (1985). High-Voltage Insulation Technology. Springer.
2.	Ravindra Arora & Wolfgang Mosch, "High Voltage and Electrical Insulation Engineering", John Wiley& Sons Publishers, 2011.
3.	E. Kuffel W.S. Zaengl, and J.Kuffel, 'High Voltage Engineering Fundamentals', Newness Publishers, Second Edition, Elsevier, New Delhi, 2005.

Course Outcomes: Upon completion of this course, the students will be able to:			**Bloom's Taxonomy Mapped**
CO1	:	Know the various insulating materials.	L2: Understanding
CO2	:	Understand the concepts of insulation design for power system equipment.	L2: Understanding
CO3	:	Analyze insulation defects in high voltage power system equipment	L4: Analyzing
CO4	:	Recite the basic methods for insulation assessment	L1: Remembering
CO5	:	Apply online insulation condition monitoring techniques	L3: Applying

COURSE ARTICULATION MATRIX															
COs/ POs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	2			1			1						1	1	
CO2	2	1	3	1	1		1						3	2	
CO3	2			3	2	1	1						1	3	
CO4	2	1	1	3		1						1	2	3	1
CO5	2	1	1	3	2		1					1	2	3	1
Avg	2	1	1.6	2.2	1.6	1	1	0	0	0	0	1	1.8	2.4	1
3/2/1-indicates strength of correlation (3- High, 2-Medium, 1- Low)															