NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III-Year (July Session) Section- A

COURSE OUTLINE			
Course Title	HIGH VOLTAGE ENGINEERING		
Course Code	EEPE15	No. of Credits	3
Department	Electrical and Electronics Engineering	Faculty	M.Bhuvaneswari
Pre-requisite Course	CIRCUIT THEORY		
Course Coordinator	M.Bhuvaneswari		
E-mail	-	Telephone No.	-
Course Type	Elective Course		

COURSE OVERVIEW

High Voltage Engineering is a course covering Power systems & High voltage testing. All the transmission lines above 132kV are high voltage lines. India is witnessing a rapid increase in electrical transmission industry due to ever increasing demand for electricity which implies the need of this course.

At the end of the course students are able to understand how lightning and switching surges affect high voltage systems, and possess the knowledge of the main features of the devices used in the high voltage field: overhead and cable lines; insulators; surge arresters; switchgears; DC, AC and impulse high voltage sources; voltage dividers. Students are aware of the concepts of dielectric breakdown in various mediums. The students are also getting the basics of insulation coordination and testing.

COURSE OBJECTIVES

To dispense an overview of various generation, measurement and testing methodologies of high DC and AC voltages and currents and also to edify the background of various breakdowns.

COURSE OUTCOMES (CO)	
Course Outcomes	**Aligned Programme Outcomes (PO)**
On completion of the course the students will be able to	
1. Describe the causes and types of overvoltage.	PO_1, PO_2, PO_5,PO_8 – PO_{14}
2. Illustrate different methods of generating and measuring various high voltages and currents.	PO_1, PO_2, PO_5,PO_8 – PO_{14}
3. Explain various breakdown phenomena occurring in gaseous, liquid and solid dielectrics.	PO_1, PO_2, PO_5,PO_8 – PO_{14}
4. Identify appropriate testing method(s) for various high voltage apparatus.	PO_1, PO_2, PO_5,PO_8 – PO_{14}

COURSE TEACHING AND LEARNING ACTIVITIES

S. No.	Week	Topic	Mode of Delivery
1.	II week of July (10^{th} – 14^{th}) **1 hr**	Introduction to the course	**Lecture** Ppt
2.	II week of July (10^{th} – 14^{th}) **2 hrs**	Causes and types of over voltages, Effects of over voltages on power system components &	**Lecture** *Chalk and talk using board& ppt*
3.	III week of July (17^{th} –21^{st}) **3 hrs**	Surge diverters, EMI and EMC protection against over voltages	**Lecture** *Chalk and talk using board & ppt*
4.	IV week of July (24^{th} – 28^{th}) **1 hr**	Insulation Coordination	**Lecture** *Chalk and talk using board & ppt*

5.	IV week of July (24^{th} – 28^{th}) **2 hrs**	Generation of high AC voltages	**Lecture** *Chalk and talk using board & ppt*
6.	I week of August (1^{st} – 4^{th}) **2 hrs**	Generation of high DC voltages	**LOecture** *Chalk and talk using board& ppt*
7.	I week of August (1^{st} – 4^{th}) **1 hr**	Generation of high switching voltages	**Lecture** *Chalk and talk using board & ppt*
8.	II week of August (7^{th} – 11^{th}) **2 hrs**	Generation of high impulse voltages and currents	**Lecture** *Chalk and talk using board& ppt*
9.	II week of August (7^{th} – 11^{th}) **1 hr**	**Assessment 1**	*Objective type*
10.	III week of August (14^{th} – 18^{th}) **2 hrs**	Measurement of high AC using sphere gaps	**Lecture** *Chalk and talk using board & ppt*
11.	IV week of August (14^{th} – 18^{th}) **1hr**	Measurement of high DC and impulse voltages using sphere gaps	**Lecture** *Chalk and talk using board & ppt*
12.	V week of August (28^{th} – 31^{st}) **1 hr**	Peak voltmeter and potential divider	**Lecture** *Chalk and talk using board & ppt*
13.	I week of September (1^{st} – 8^{th}) **2 hrs**	High speed CRO and digital techniques	**Lecture** *Chalk and talk using board & ppt*
14.	I week of September (1^{st} – 8^{th}) **1 hrs**	**Assessment 2**	**Problem Solving**
15.	II week of September (11^{th} – 15^{th}) **2 hrs**	Dielectric breakdown, Breakdown in gases.	**Lecture** *Chalk and talk using board & ppt*
16.	II week of September (11^{th} – 15^{th}) **1 hr**	Breakdown in liquids and solids.	**Lecture** *Chalk and talk using board & ppt*

17.	II week of September (11^{th} – 15^{th}) **1 hr**	Partial discharges	**Lecture** *Chalk and talk using board & ppt*
18.	IV week of September (25^{th} – 28^{th}) **1hr**	Corona discharges	**Lecture** *Chalk and talk using board & ppt*
19.	I week of October (3^{rd} – 6^{th}) **2 hrs**	**Assessment 3**	**Assignment Test**
20.	I week of October (3^{rd} – 6^{th}) **1 hr**	Introduction to high voltage testing	**Lecture** *Chalk and talk using board & ppt*
21.	II week of October (9^{th} – 13^{th}) **2 hrs**	Testing of circuit breakers and insulators	**Lecture** *Chalk and talk using board& ppt*
22.	II week of October (9^{th} – 13^{th}) **1 hr**	**Assessment 4**	**Objective type test**
23.	III week of October (16^{th} – 20^{th}) **1 hr**	Testing of Bushings	**Lecture** *Chalk and talk using board& ppt*
24.	III week of October (16^{th} – 20^{th}) **2 hrs**	Testing of surge diverters, Standards and specifications	**Lecture** *Chalk and talk using board & ppt*
25.	IV week of October (23^{th} – 27^{th}) **2 hrs**		
26.	IV week of October (23^{th} – 27^{th}) **1 hr**	**Assessment 5**	**Problem solving**
27.	II week of November (6^{th} – 11^{th}) **1 hr**	**CPA**	
28.	III week of November (13^{th} – 17^{th}) **2 hrs**	**Assessment 6**	**End semester exam- Descriptive Type**

COURSE ASSESSMENT METHODS				
S. No.	**Mode of Assessment**	**Week/Date**	**Duration**	**% Weightage**
1.	**Objective Type**	II week of August (7^{th} – 11^{th})	1 hr	10%
2.	**Problem solving**	I week of September (1^{st} – 8^{th})	1 hr	10%
3.	**Assignment test**	I week of October (3^{rd} – 6^{th})	1 hr	20%
4.	**Objective Type**	II week of October (9^{th} – 13^{th})	1 hr	10%
5.	**Problem Solving**	IV week of October (23^{th} – 27^{th})	*1hr*	20%
6.	**CPA**	II week of November (6^{th} – 11^{th})	1hr	20%
7.	**End Semester exam**	III Week of November (13^{th} - 17^{th})	2 hrs	30%

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

1. Wadhwa,C.L., ' Hig0h Voltage Engineering', 3rd Edition, New Age International Publishers Ltd., New Delhi, 2010.
2. Naidu, M.S. and Kamaraju,V., 'High Voltage Engineering', 4th Edition, Tata McGraw-Hill Publishing Company, New Delhi,4th Edition, 2009.
3. E. Kuffel, W. S. Zaengl, J. Kuffel, 'High Voltage Engineering: Fundamentals', Butterworth-Heinemann, 2nd Edition, 2000.

COURSE EXIT SURVEY

1. Students' feedback through class committee meetings
2. Feedback questionnaire from students – twice during the semester
3. Feedback from students on Course Outcomes at the end of the semester

COURSE POLICY

1. All the students are expected to attend all the contact hours.
2. Students who fall short of 75% attendance to the contact hours are not eligible to appear for the final written examination of 30% weightage.
3. Any Student who fails to maintain 75% attendance needs to appear for a CPA exam. Student who scores more than 50% will be eligible for attending the end semester examination.
4. Students not having 75% attendance and also fail in CPA exam will have to redo the course.
5. Attending all the assessments is MANDATORY for every student.
6. If any student is not able to attend any of the continuous assessments, due to genuine reason, student is permitted to attend the compensation assessment (CPA) with 20 % weightage. At any case, CPA will not be considered as an improvement test.
7. Relative grading with a passing minimum is as per our institute norms
8. In case of any student found guilty indulging in any mal practice, he/she will be awarded no marks in that particular assessment. If found using mobile phones or any other gadgets for any mal-practice during the final written examination, the answer sheet of the student will not be evaluated and will be awarded ZERO marks in the final written examination.

ADDITIONAL COURSE INFORMATION

1. The Course Coordinator is available for consultation during the time intimated to the students then and there.
2. All correspondence will be sent to the webmail id of the students alone. Hence all students are advised to check their webmail ids regularly.

FOR SENATE'S CONSIDERATION

[M.Bhuvaneswari, TF/EEE]	[Dr.Sishaj.p.Simon]	HoD/Dept. of EEE
Course Faculty	CC-Chairperson	