NIRMA UNIVERSITY

Institute:	**Institute of Technology**
Name of Programme:	**B.Tech. in Electrical Engineering**
Semester:	**VII**
Course Code:	**2EEDE11**
Course Title:	**EHVAC and FACTS Devices**
Course Type:	(□ Core/ □ Value Added Course / √ **Department Elective**/ □ Institute Elective/ □ University Elective/ □ Open Elective/ □ Any other)
Year of Introduction:	**2021 – 22**

Credit Scheme

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

At the end of the course, students will be able to –

1. identify the issues of conventional power transmission and offer solutions
2. calculate electric fields in EHVAC transmission system and suggest design parameters
3. interpret performance characteristics of various compensating devices
4. select appropriate reactive power compensating device for improving power system performance

Syllabus: **Total Teaching hours: 45**

Unit	Syllabus	Teaching hours
Unit-I	**EHVAC Transmission System** Need of EHVAC transmission, power handling capacity, line loss, sequence impedance calculation, calculation of transmission line parameters, sequence impedances for lines with ground returns, lines with bundle conductors and ground returns, sequence networks for various three phase transformer connections.	**12**
Unit-II	**Corona, Electrostatic and Magnetic Fields** Basic phenomenon and calculation of voltage gradient of conductors, power loss, audible noise and radio interference due to corona, electrostatic field of EHV lines, power frequency magnetic fields, effect on humans, animals and plants.	**10**
Unit-III	**Design of EHV Transmission Line** Introduction, design factors under steady state limits, EHV line insulation design based on transient over voltages, effects of pollution on performance of EHV lines, modern trends in EHVAC transmission, Protection against switching overvoltages, lightning overvoltage. Surge diverters, surge capacitors and reactors, overhead ground wires.	**06**
Unit-IV	**Flexible AC Transmission Systems** Emergence of FACTS, FACTS control considerations, FACTS controllers.	**02**

Unit-V	**Shunt and Series Compensation** Shunt SVC principles, configuration and control, STATCOM, configuration applications, fundamental of series compensation using GCSC, TCSC and TSSC, application of TCSC for different problems of power system, SSSC principle of operation, power angle characteristics- control range and VA rating- combined compensators, Unified Power Flow Controllers (UPFC)- basic operating principles and characteristics, independent active and reactive power flow control, control of UPFC, installation, applications.	**15**

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings/ References:

1. Rakosh Das Begamudre, Extra High Voltage AC Transmission Engineering, New Age Publishers.
2. S. Rao, HVAC and HVDC Transmission, Engineering and Practice, Khanna Publisher, Delhi.
3. Hingorani N. G. and Gyugyi L., Understanding FACTS, IEEE Press, Standard Publishers Distributors.
4. T.J.E. Miller, Reactive Power Control in Electric Systems, John Wiley and Sons.
5. V.K. Sood, HVDC and FACTS Controller, Springer.
6. Y. H. Song and A. T. John, Flexible AC Transmission Systems, IEEE Press.
7. R. M. Mathur and R. K. Verma, Thyristor Based FACTS Controllers for Electrical Transmission Systems, IEEE Press.
8. EPRI, Transmission Line Reference Book, 345 kV and above, Electric Power Research Institute. Palo Alto, California.
9. Relevant recent literature, journal articles

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2021 - 22 and onwards