TEERTHANKER MAHAVEER UNIVERSITY

(Established under Govt. of U. P. Act No. 30, 2008)

Delhi Road, Moradabad (U.P.)

PhD PROGRAMME

SYLLABUS FOR DISCIPLINE SPECIFIC COURSE
ELECTRICAL ENGINEERING

Course Code: PDS240130	Advances in Electrical Engineering	L	T	P	C
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Objective:	To familiarize the research scholar with the fundamentals of scientific research.				
Course Outcomes:	On completion of the course, the students will be able:				
CO 1:	To understand the fundamentals of the Smart grid and control aspects of the smart grid.				
CO 2:	To analyze the effect of power quality issues on distribution systems and their mitigation through active filters.				
CO 3:	To design PV systems, wind turbine generator systems, and hybrid systems for any application				
CO 4:	To analyze the EV propulsion system and electric motors for vehicular applications				
CO 5:	To evaluate the value of components used in AC-DC converters.				
Course Content:					
Unit 1:	Power quality problems and their mitigation techniques: Definition, Power Quality Problems, Causes and Consequences, voltage sags, swells, interruptions, flicker, reactive power, and harmonics. Load Current Compensation, Reactive power compensation, and zero voltage regulation. Compensation through series and shunt active power filter, D-STATCOM.				
Unit 2:	PV Systems: Design of PV systems-Standalone system with DC and AC loads with and without battery storage, Grid-connected PV systems. Wind energy: Energy in the wind - aerodynamics - rotor types, forces developed by blades, Aerodynamic models, braking systems, power curve, power speed characteristics, choice of electrical generators.				
Unit 3:	Hybrid Electric Drivetrains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.				
Unit 4:	DC to AC Converters: Analysis of output voltage waveforms of single phase and three phase voltage source inverters. Methods of reducing output harmonics.				
Unit 5:	Smart Grid: Introduction to grid connectivity of RE systems, smart grid and emerging technologies, operating principles and models of smart gird				

	components, key technologies for generation, networks, loads and their control capabilities.
Textbooks:	1. Understanding Power Quality Problems: Voltage Sags and Interruptions by Math H. Bollen, Wiley-IEEE Press 2. N. Mohan, T.M. Undeland & W.P. Robbins, Power Electronics: Converter, Applications & Design, John Wiley & Sons, 1989 3. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010
Reference Books:	1. Van Overstraeton and Mertens R.P, "Physics, Technology and use of Photovoltaics", Adam Hilger. 2. John F. Walker & Jenkins. N, "Wind energy Technology', John Wiley and sons. 3. Referred Journal/Conference publications
Additional Electronic Reference Material:	1. https://archive.nptel.ac.in/courses/108/102/108102179/ 2. https://nptel.ac.in/courses/103103206 3. https://onlinecourses.nptel.ac.in/noc23_ee60/preview 4. https://archive.nptel.ac.in/courses/108/102/108102145/