15PEC19 DISTRIBUTED GENERATION AND MICRO-GRIDS

COURSE OBJECTIVES:
- To illustrate the concept of distributed generation
- To analyze the impact of grid integration.
- To study concept of Micro grid and its configuration

COURSE OUTCOMES:
- Understand the various schemes of conventional and nonconventional power generation.
- Explain about different topologies and energy sources of distributed generation.
- Understand the requirements for grid interconnection and its impact with NCE sources
- Understand the fundamental concept of Micro grid.

UNIT I INTRODUCTION


UNIT II DISTRIBUTED GENERATIONS

Concept of distributed generations, topologies, selection of sources, regulatory standards/ framework, Standards for interconnecting Distributed resources to electric power systems: IEEE 1547. DG installation classes, security issues in DG implementations. Energy storage elements: Batteries, ultra-capacitors, flywheels. Captive power plants

UNIT III IMPACT OF GRID INTEGRATION

Requirements for grid interconnection, limits on operational parameters.: voltage, frequency, THD, response to grid abnormal operating conditions, islanding issues. Impact of grid integration with NCE sources on existing power system: reliability, stability and power quality issues.

UNIT IV BASICS OF A MICROGRID

Concept and definition of micro grid, micro grid drivers and benefits, review of sources of micro grids, typical structure and configuration of a micro grid, AC and DC micro grids, Power Electronics interfaces in DC and AC micro grids

UNIT V CONTROL AND OPERATION OF MICROGRID

Modes of operation and control of micro grid: grid connected and islanded mode, Active and reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques, micro grid communication infrastructure, Power quality issues in micro grids, regulatory standards, Micro grid economics, Introduction to smart micro grids

TOTAL: 45 PERIODS
TEXTBOOKS:


REFERENCE BOOKS:


15PEC20 ELECTRIC VEHICLES AND POWER MANAGEMENT

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COURSE OBJECTIVES:

- To understand the concept of electrical vehicles and its operations
- To understand the need for energy storage in hybrid vehicles
- To provide knowledge about various possible energy storage technologies that can be used in electric vehicles

COURSE OUTCOMES:

- Understand the operation of Electric vehicles
- Understand various energy storage technologies for electrical vehicles

UNIT I INTRODUCTION

Electric Vehicles (EV)-Hybrid Electric Vehicles (HEV)-Engine ratings- Comparisons of EV with internal combustion Engine vehicles- Fundamentals of vehicle mechanics

UNIT II ARCHITECTURE OF EV’s AND POWER TRAIN COMPONENTS

Architecture of EV’s and HEV’s – Plug-n Hybrid Electric Vehicles (PHEV)- Power train components and sizing, Gears, Clutches, Transmission and Brakes

UNIT III CONTROL OF DC AND AC DRIVES

DC/DC chopper based four quadrant operations of DC drives – Inverter based V/f Operation (motoring and braking) of induction motor drive system – Induction motor and permanent motor based vector control operation – BLDC - Switched reluctance motor (SRM) drives.

UNIT IV BATTERY ENERGY STORAGE SYSTEM

Basics- Parameters-Capacity, Discharge rate, State of charge, state of Discharge, Depth of Discharge, Types-Lead Acid Battery-Lithium ion battery- Lead Acid Battery-Lithium ion Battery-Technical characteristics- Modelling of battery capacity- Calculation of Peukert Coefficient
UNIT V ALTERNATIVE ENERGY STORAGE SYSTEMS

Fuel cell – Characteristics- Types – hydrogen Storage Systems and Fuel cell EV – Ultra capacitors

TOTAL: 45 PERIODS

TEXTBOOKS:


REFERENCE BOOKS:


15PEC21 SPECIAL TOPICS IN POWER ELECTRONICS

COURSE OBJECTIVES:

- To understand about Active Power factor correction techniques
- To understand the operation of matrix converter
- To understand application of power electronics in lamp ballast
- To study about different active power filters
- To study about battery chargers

COURSE OUTCOMES:

- Understand the operation of Active Power factor correction techniques and matrix converter
- Understand different electronic ballast
- Explain about different active power filters and battery chargers

UNIT I ACTIVE POWER FACTOR CORRECTION FOR AC-DC CONVERTERS

Generation of current harmonics from AC to DC converter- Harmonics standard and recommended practice-Need for improved utility Interface- Diode rectifier-fed boost converter -Working of Three phase PWM rectifier and its advantages- Interface for bidirectional power flow single phase and three phase

UNIT II MATRIX CONVERTER

Introduction-Advantages of matrix converter-Switching states of 3-phase to 3-phase matrix converter-Bidirectional switch topologies-Modulation schemes for Matrix converter-Matrix converter based drive scheme-Implementation aspects of matrix converter

UNIT III ELECTRONIC BALLAST

Need for Ballast in Lamps-Comparison between Electric ballast and Electronic ballast-General block diagram of Electronic ballast-Classification of Electronic ballast-Non-Resonant ballast-Resonant ballast: Current fed resonant
ballast, Voltage Fed resonant ballast-Electronic ballast with active power factor correction-Ballast for LED- Design of Electronic ballast

UNIT IV ACTIVE POWER FILTERS

Need for active power filters-Types of active filter-Instantaneous power theory-Synchronous reference frame theory-Topologies of 3-phase shunt active filter-Block diagram of shunt active filter control schemes-Series active filter topologies and control scheme

UNIT V BATTERY CHARGERS

Factors affecting battery performance: Battery voltage level, Battery Discharge current, Battery Temperature during discharge-Factors affecting Choice of a battery-Battery charging and discharging methods-Charge controllers for stand-alone PV system-Types of charge controllers for stand-alone PV system: Shunt type, Series type, DC-DC converter type, MPPT charge controller –Power stage and control scheme for battery charging using DC-DC converter-Flow chart for battery charging

TOTAL: 45 PERIODS

TEXTBOOKS:


REFERENCE BOOKS: