

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electrical & Electronics Engineering, VIII-Semester

Open Elective EX- 803 (A) Power Electronics Converters for Renewable Energy

UNIT- I Introduction to renewable sources: world energy scenario, Wind, solar, hydro, geothermal, availability and power extraction. Introduction to solar energy: Photovoltaic effect, basics of power generation, P-V & I-V characteristics, effect of insolation, temperature, shading; Modules, connections, ratings; Power extraction (MPP), tracking and MPPT schemes; standalone systems, grid interface, storage, AC-DC loads.

Unit-II Power converters for solar: Micro converter, DC-DC buck/boost/buck-boost /flyback /forward/cuk, bidirectional converters; Inverters: 1ph, 3ph inverters Multilevel Neutral point clamp, Modular multilevel, CSI; Control schemes: unipolar, bipolar.

Unit- III Single phase and three-phase back Controllers. Triggering techniques for power factor and harmonic controls. Design and analysis of phase control circuits. Solid state transfer switches. Concept of three-phase to single phase and single phase to three-phase cyclo-converter. Effect of source inductance. Concept of PWM techniques single and multiple pulse form. Working of STATCON, SVC, UPS, SMPS.

Unit- IV Intro to wind energy: P-V, I-V characteristic, wind power system: turbine-generator-inverter, mechanical control, ratings; Power extraction (MPP) and MPPT schemes. PLL and synchronization, power balancing / bypass, Parallel power processing; Grid connection issues: leakage current, Islanding mode, harmonics, Mitigation of harmonics, filters, passive filters, Active filters, active/reactive power feeding, unbalance.

Unit-V Generators for wind: DC generator with DC to AC converters; Induction generator with & w/o converter; Synchronous generator with back to back controlled/ uncontrolled converter; Doubly fed induction generator with rotor side converter topologies; permanent magnet based generators. Battery: Types, charging discharging.

References:

1. Sudipta Chakraborty, Marcelo G. Sim303265es, and William E. Kramer. Power Electronics for Renewable and Distributed Energy Systems: A Sourcebook of Chetan Singh Solanki, Solar Photovoltaics: fundamentals, Technologies and Applications, Prentice Hall of India, 2011.
2. N. Mohan, T.M. Undeland & W.P. Robbins, Power Electronics: Converter, Applications & Design, John Wiley & Sons, 1989
3. Remus Teodorescu, Marco Liserre, Pedro Rodriguez, Grid Converters for Photovoltaic and Wind Power Systems, John Wiley and Sons, Ltd., 2011.

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Open Elective EX- 803 (B) Environmental Issues, Policy, Standards & Regulations

UNIT 1 Global environmental concerns: The Scenario, The Changing Global atmosphere & common concerns. United Nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol, Conference of Parties (COP), Various Clean Development Mechanism (CDM), Prototype Carbon fund (PCF), Earth Summit, Sustainable development. Green Certificate

UNIT-2 The Global Program for protected area management, Strategies for environmental improvement plan. Organizations working in the field of energy and environment - UNEP, IPCC, CPCB etc. Basic features of ISO 14000.

UNIT-3 Water Quality: Parameters: Physical, Chemical and Bacteriological .Potable Water Standards, Waste Water Effluent Standards. Minimal National Standards (MINAS).

UNIT -4 Environment Policies: Water Act 1974, The Air Act, 1981, Environmental (Protection) Act.- 1986, M. P. State Environment Policy, Municipal Solid Waste (Management & Handling) Rules, 1998, Biomedical Waste (Management & Handling) Rules 1998.

UNIT-5 Review of various energy sources. Importance of unconventional sources such as solar, biogas, wind, tidal etc. Study of typical energy converters such as high performance motors, special generators driven by biogas engines, wind turbines etc. Mini-hydro generators. Modern state-of-the art and futuristic systems in this area.

References:

1. Environmental Issues and Policies, Prentice Hall—Stephon Ison, Stephen Peake, Stuart Wall
2. ISO 14000 Environmental Management by Goetsch, Davis. Prentice Hall
3. Standard methods for the Examination of Water and Wastewater. (1989).17thEd. APHA, Washington. D.C., 2-12
4. Energy Management by Paul O'Callaghan –McGraw Hill
5. Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council
6. Training material on 'Environmental concerns' prepared by National Productivity Council

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Open Elective EX- 803 (C) VLSI circuits and systems

UNIT-I MOSTRANSISTORPRINCIPLE

NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams

UNIT-II COMBINATIONAL LOGIC CIRCUITS

Examples of Combinational Logic Design, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles.

UNIT-III SEQUENTIAL LOGIC CIRCUITS

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design.

UNIT-IV DESIGNING ARITHMETIC BUILDING BLOCKS

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT-V IMPLEMENTATION STRATEGIES

Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

REFERENCE BOOKS

1. N.Weste, K.Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addison Wesley 1993
2. R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India 2005
3. A.Pucknell, Kamran Eshraghian, "BASIC VLSI Design", Third Edition, Prentice Hall of India, 2007.

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Open Elective EX- 803 (D) Data Analytics

Course Objectives:

Data Analytics is the science of analyzing data to convert information to useful knowledge. This knowledge could help us understand our world better, and in many contexts enable us to make better decisions. While this is broad and grand objective, the last 20 years has seen steeply decreasing costs to gather, store, and process data, creating an even stronger motivation for the use of empirical approaches to problem solving.

This course will enable you with a wide range of data analytic techniques and is structured around the broad contours of the different types of data analytics, namely, descriptive, inferential, predictive, and prescriptive analytics.

Pre-requisites:

This course requires that you are familiar with high-school level linear algebra, and calculus. Knowledge of probability theory, statistics, and programming is desirable

UNIT-I

DESCRIPTIVE STATISTICS :Probability Distributions, Inferential Statistics ,Inferential Statistics through hypothesis tests Regression & ANOVA ,Regression ANOVA(Analysis of Variance).

UNIT-II

INTRODUCTION TO BIG DATA: Big Data and its Importance, Four V's of Big Data, Drivers for Big Data, Introduction to Big Data Analytics, Big Data Analytics applications.

BIG DATA TECHNOLOGIES: Hadoop's Parallel World, Data discovery, Open source technology for Big Data Analytics, cloud and Big Data, Predictive Analytics, Mobile Business Intelligence and Big Data, Crowd Sourcing Analytics, Inter- and Trans-Firewall Analytics, Information Management.

UNIT-III

PROCESSING BIG DATA: Integrating disparate data stores, Mapping data to the programming framework, Connecting and extracting data from storage, Transforming data for processing, subdividing data in preparation for Hadoop Map Reduce.

UNIT-IV

HADOOP MAPREDUCE: Employing Hadoop Map Reduce, Creating the components of Hadoop Map Reduce jobs, Distributing data processing across server farms, Executing Hadoop Map Reduce jobs, monitoring the progress of job flows, The Building Blocks of Hadoop Map Reduce Distinguishing Hadoop daemons, Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

UNIT-V

BIG DATA TOOLS AND TECHNIQUES: Installing and Running Pig, Comparison with Databases, Pig Latin, User- Define Functions, Data Processing Operators, Installing and Running Hive, Hive QL, Querying Data, User-Defined Functions, Oracle Big Data.

Reference Books and Study Materials:

1. Hastie, Trevor, et al. ♦ The elements of statistical learning. Vol. 2. No. 1. New York: springer, 2009.
2. Montgomery, Douglas C., and George C. Runger. ♦ Applied statistics and probability for engineers. John Wiley & Sons, 2010
3. NPTEL Video Course :Introduction to Data Analytics by Dr. Balaraman Ravindran Department of Computer Science and Engineering IIT Madras and Dr. Nandan Sudarsanam Department of Management Studies IIT Madras.