RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electrical & Electronics Engineering, VIII-Semester

EX-801 – Electrical Drives

UNIT-I Basic Concepts of Electric Drives Elements of drive systems, Requirement of electric drives, Rating & Selection of drives, groups and individual drives, Constant power and Constant torque drives. Motor Mechanism dynamics Review of Characteristics of AC & DC motors, load characteristic, load-drive speed torque characteristics, quadrant speed torque characteristics. Mechanical Systems Stability of Electric drives, referred moment of inertia and torque of motor load combination, load equalization.

UNIT-II DC Drives Starting & Braking of conventional, Phase controlled and chopper controlled drives, Transient & Steady state analysis, Energy recovery systems.

UNIT-III Induction Motor Drives Conventional method of Starting braking and speed control, PWM, (VSI) Voltage source Inverter and Current Sources (CSI) fed IM drives, cyclo converter fed drive, Vector control drives. Slip Controlled IM Drives Review of Conventional methods & converter controlled-Crammers &Scherbius drives; rotor impedance control.

UNIT-IV Synchronous Motors Drives VSI and CSI fed; self-controlled-Brush less &. commutatorless dc & ac motor drives.

UNIT-V Special Drives :Fundamentals of Switched reluctance motors, Stepper Motors, Permanent Magnet Motor Introduction to vector control; Digital control of drives. Case Studies Electric traction, steel & cements plants, textile & paper mills, machine tool drive and CNC, electric cars.

LIST OF EXPERIMENTS (EXPANDABLE)

1. Study the starting and running characteristics of converter fed DC traction motor.
2. To study the energy recovery systems and braking of a DC drive.
3. To study the braking Methods of a three-phase induction motor.
4. To study the performance of VSI fed three-phase induction motor using PWM technique.
5. To control the speed of a three phase slip ring Induction motor using rotor impedance control.
6. To study the performance of Vector Controlled three phase Induction motor drive.
7. To Study frequency Controlled Synchronous motor drive.
8. To study the control & performance Characteristics of switched Reluctance motor.
9. To study the performance & control of a Stepper motor.
10. To Study the Performance of a permanent magnet Brushless dc motor drive.

REFERENCE BOOKS

1. Pillai S. K. "A first course on Electrical Drives", Second edition, Wiley Eastern.
2. Ned Mohan Electrical Machine Drive WILEY INDIA
3. Dubey G. K., "Power Semiconductor Controlled Drives", PHI,
4. Dubey G. K. , "Fundamentals of Electrical Drives". Narosa Publishing House.
5. Bose B. K., "Power Electronics and AC Drives", PHI Learning.
6. Murphy M. D., and Tumbuli F., "Power Electronic Control of AC Motors", Pergamon
7. Press, Oxford University Press.
8. P.V. Rao, "Power semiconductor Drives", BS Publications
9. S.ShivaNagaraju power semiconductor drive PHI learning

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New Scheme Based On AICTE Flexible Curricula

Electrical & Electronics Engineering, VIII-Semester

Departmental Elective EX- 802 (A) Power quality Problems and mitigation techniques

UNIT-I Introduction, power quality -voltage quality, power quality evaluations procedures term and definition: general classes of power quality problem, causes & effect of power quality disturbances.

UNIT-II Loads that causes power quality problems, State of art on Passive shunt and series compensation, Classification and working of passive shunt and series compensation, Classification, Principle and control of active shunt compensator: DSTATCOM, Active series compensators, working and its control.

UNIT-III Introduction to unified power quality compensators, classification, working and operation of UPQC.

UNIT-IV Voltage sags and interruption: sources of sags and interruption, estimating voltages sag performance, fundamental principles of protection, monitoring sags. Transients over voltages: sources of transient over voltages, principles of over voltages protection, utility capacitor switching transients, fundamentals of harmonics and harmonics distortion, harmonics sources from commercial load and from industrial loads.

UNIT-V Applied harmonics : harmonics distortion evaluations, principles for controlling harmonics, harmonics studies devices for controlling harmonic distortion, Shunt active and passive filters, their operation and control.

Reference Books:

1. Power Quality- by R.C. Duggan
2. Power System harmonics –by A.J. Arrillga
3. Power electronic converter harmonics –by Derek A. Paice
4. Power quality problems and mitigation techniques: Bhim singh, Amrish Chandra, Kamal Al- Haddad.

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Electrical & Electronics Engineering, VIII-Semester

Departmental Elective EX- 802 (B) Special Machine

UNIT- I Stepper Motors: Discretisation of angular position by stepper structures, stepping angle and frequency of excitation. VR and PM rotor structures and their torque production, torque angle characteristics. The hybrid structure and torque production by permanent magnet and excitation fluxes. Power electronic converters for stepper motors, control by load angle.

UNIT - II Switched reluctance motor, static torque production, partition of energy and the effects of saturation, Dynamic torque production, torque speed characteristics, shaft position sensing, solid rotors.

UNIT- III BrushLess DC Motor construction and principle, speed control, basic concept of torque, outer and inner rotor, magnetic circuit concept, electrical analogy, winding pattern series and parallel, Thermal consideration.

UNIT- IV Permanent magnet materials and circuits; Characteristics, parameters, properties, classification and calculations, Permanent magnet motors, D.C. brushed motors, design analysis and control and applications.

UNIT- V PM synchronous motors, rotor construction, theory, operation, control and applications. PM step motors, hybrid step motors, sensorless control, reduction of torque pulsations; Case studies such electric vehicles, industrial drives, PV fed water pumping.

Reference Books:

1. Brushless Permanent Magnet & Reluctance Motor Drives – T.J.E.Miller
2. Principles of Electric Machines & Power Electronics – P.C.Sen
3. Electric Drives – G.K.Dubey
4. Permanent magnet synchronous & brushless DC motor drives- R Krishnan, CRCPress, 2004

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Electrical & Electronics Engineering, VIII-Semester

Departmental Elective EX- 802 (C) SCADA Systems & Applications

Unit I Introduction to SCADA and PLC:SCADA: Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Ladder diagram, Functional Block diagram, Applications, Interfacing of PLC with SCADA. SCADA system components: Schemes, Remote Terminal Unit, Intelligent Electronic Devices, Communication Network, SCADA server.

Unit II SCADA Architecture-Various SCADA Architectures, advantages and disadvantages of each system, single unified standard architecture IEC 61850 SCADA / HMI Systems.

Unit III SCADA Communication-Various industrial communication technologies- wired and wireless methods and fiber optics, open standard communication protocols.

Unit IV Operation and control of interconnected power system-Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, state estimation.

Unit V: SCADA applications Utility applications, transmission and distribution sector operation, monitoring analysis and improvement. Industries oil gas and water. Case studies, implementation, simulation exercises.

Reference Books:

1. Stuart A Boyer: SCADA supervisory control and data acquisition.

2. Gordan Clark, Deem Reynders, Practical Modem SCADA Protocols.

3. Sunil S. Rao, Switchgear and Protections, Khanna Publication.

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New Scheme Based On AICTE Flexible Curricula

Electrical & Electronics Engineering, VIII-Semester

Departmental Elective EX- 802 (D) Application of AI in Electrical/Electronics Engg.

Unit 1:
Introduction-Models of Neural Network – Architectures – Knowledge representation – Artificial Intelligence and Neural networks – Learning process – Error correction learning – Hebbian learning – Competitive learning – Boltzman learning – Supervised learning – Unsupervised learning – Reinforcement learning – learning tasks.

Unit 2:
Multi – layer perceptron using Back propagation Algorithm-Self – organizing Map – Radial Basis Function Network – Functional link, network – Hopfield Network.

Unit 3:
Introduction – Fuzzy versus crisp – Fuzzy sets – Membership function – Basic Fuzzy set operations – Properties of Fuzzy sets – Fuzzy cartesian Product – Operations on Fuzzy relations – Fuzzy logic – Fuzzy Quantifiers – Fuzzy Inference – Fuzzy Rule based system – Defuzzification methods

Unit 4:
Introduction-Encoding – Fitness Function-Reproduction operators – Genetic Modeling – Genetic operators – Crossover – Single–site crossover – Two-point crossover – Multi point crossover-Uniform crossover – Matrix crossover – Crossover Rate – Inversion & Deletion – Mutation operator –Mutation – Mutation Rate-Bit-wise operators – Generational cycle-convergence of Genetic Algorithm.

Unit 5:
Load forecasting – Load flow studies – Economic load dispatch – Load frequency control – Single area system and two area system – Small Signal Stability (Dynamic stability) Reactive power control – speed control of DC and AC Motors.

Reference Book:

S. Rajasekaran and G. A. V. Pai, “Neural Networks, Fuzzy Logic & Genetic Algorithms”-PHI, New Delhi, 2003:
P. D. Wasserman, Van Nostrand Reinhold, ”Neural Computing Theory & Practice” – New York, 1989.

Bart Kosko, ”Neural Network & Fuzzy System” Prentice Hall, 1992.
G. J. Klir and T. A. Folger, ”Fuzzy sets, Uncertainty and Information”-PHI, Pvt.Ltd,1994.
D. E. Goldberg,” Genetic Algorithms”- Addison Wesley 1999

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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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New Scheme Based On AICTE Flexible Curricula

Electrical & Electronics Engineering, VIII-Semester

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 (UNFCC), 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, IPCCC, CPCB etc. Basic features of ISO 14000.

UNIT-3 Water Quality: Parameters: Physical, Chemical and Bacteriological .Potable Water Standards, Waste Waster 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-ofthe art and futuristic systems in this area.

References:

1. Environmental Issues and Polices, 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, Washigton. 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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Electrical & Electronics Engineering, VIII-Semester

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 **SEQUENTIALLOGICCIRCUITS**

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 **DESIGNINGARITHMETICBUILDINGBLOCKS**

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 **IMPLEMENTATIONSTRATEGIES**

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, Addision 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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New Scheme Based On AICTE Flexible Curricula

Electrical & Electronics Engineering, VIII-Semester

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.

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Electrical & Electronics Engineering, VIII-Semester

EX-804 – SIMULATION LAB

1. Study of various Electrical Toolbox i.e Power System, Power Electronics, Control system, Electrical Measurement, Flexible AC Transmission.

2. Developing Simulation Models for single and three phase Rectifier, Inverter, and Converter for different load models.

3. Developing Simulation Models using FACTs Devices i.e STATCOM, SVC, TCSC, SSSC, IPFC, UPFC in power system transmission lines.

4. Developing Simulation Models of power electronics-based AC & DC Electrical Drives.

Note: -All Experiments based on MATLAB, SCILAB & other SIMULATION software.

REFERENCE

1. Shailendra Jain "Modeling and Simulation using MATLAB Simulink" wileyindia& sons
2. https://www.scilab.org/
3. https://www.mathworks.com/products/matlab.html

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Electrical & Electronics Engineering, VIII-Semester

EX-805 – Major Project-II

GUIDELINES

The objectives of the course 'Major Project-I' are To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses. To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems. To give students an opportunity to do something creative and to assimilate real life work situation in institution.
To adapt students for latest developments and to handle independently new situations.
To develop good expressions power and presentation abilities in students.
The focus of the Major Project is on preparing a working system or some design or understanding of a complex system using system analysis tools and submit it the same in the form of a write-up i.e. detail project report. The student should select some real life problems for their project and maintain proper documentation of different stages of project such as need analysis, market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan. Each student is required to prepare a project report and present the same at the final examination with a demonstration of the working system (if any).
The faculty and student should work according to following schedule:
i) Each student undertakes substantial and individual project in an approved area of the subject and supervised
by a member of staff.
ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.
iii) At all the steps of the project, students must submit a written report of the same.