PROGRAMME : BE Electrical & Electronics Engineering-VIII Semester

Course: EX801 Computer-Aided Design of Electrical Machines

Course Contents

Unit-I

Introduction: Design problem-Mathematical programming methods, computer aided design- Mathematical formulation of the problem. Programming techniques (LP & NLP only), Methods of solution, Unconstrained optimization problems, constrained optimization problems.

Unit-II

Optimal design of DC machine:-Design of armature, Windings and field systems, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit-III

Optimal design of power transformer:-Design of magnetic circuit, Design of windings, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit-IV

Optimal design for 3-phase alternator:-Design of stator, windings, Design of Field systems for salient pole and non-salient pole machines, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit-V

Optimal design of 3-phase induction motor:-Design of stator, Windings Design of squirrel cage rotor, Design of slip ring rotor, Selection of variables for optimal design, Formulation of design equations, Objective functions Constraint functions, Algorithms for optimal design.

References:

1. Design and Testing of Electrical Machines,MV Deshpandey PHI Learning
2. Computer- Aided Design of Electrical Equipment- by Dr. M. Ramamoorthy-Affiliated East-West press Pvt. Ltd. New Delhi.
3. Electrical Machine Design- by A.K. Sawhney, Dhanpat Rai & Sons.
4. Principles of Electrical Machine Design with Computer Programmes by- S.K. Sen, Oxford & IBH Publishing Co.
5. Performance and Design of A.C. Machines-M.G. Say, Affiliated East West Press Pvt. Ltd., New Delhi.

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Course: EX-802 Computer Applications to Power Systems

Course Contents

Unit-I

Models of power system components, network model using graph theory, formation of Z bus, transmission line models, regulating transformer, line loadability, capability curves of alternator.

Unit-II

Control of load bus voltage using reactive power control variable, SVC & SVS, Regulated shunt compensation, series and shunt compensation, Uniform series and shunt compensation and effect on loadability of transmission lines.

Unit-III

Sensitivity analysis- General sensitivity relations, generation shift distribution factors, line outage distribution factors, compensated shift factors, sensitivity associated with voltage-VAR, sensitivities relating load bus voltage changes in terms of PV bus voltage changes, sensitivity relating changes in reactive power generation for changes in PV Bus Voltage.

Unit-IV

Power system security - Security functions, Security level, contingency analysis, security control, economic dispatch using LP formulation, pre-contingency and post- contingency, corrective rescheduling.

Unit-V

Voltage stability - Difference between voltage and angle stability, PV Curve for voltage stability assessment, proximity and mechanism, modal analysis using reduced Jacobian, participation factor, effect of series and shunt compensation on voltage stability , effect of load models.

References:

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1. Computer Modeling of Electrical Power Systems, Arrillaga J. watson N R Wiley India
2. A Chakrawarti Power System Analysis: Operation and Control PHI Learning 3rd edition
3. Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.
4. Computer Techniques in Power Systems Analysis- Pai M.A. Tata Mc Graw Hill.
5. Computer Aided Power Systems Analysis Kusic G.L. 2nd Edition, CRC Press
6. Modern Power Systems Analysis Nagrath I.J. and Kothari D.P. Tata Mc Graw Hill.
7. Power System Analysis Grainger J.J. & Stevnson W.D. Mc Graw Hill.
8. Power System Stability and control -P Kundur ,IEEE Press 1994.
9. Advance Power Systems Analysis and Dynamics Singh L.P. John Wiley.

PROGRAMME : BE Electrical & Electronics Engineering-VIII Semester

Course: EX8301 Advanced Power Electronics

Course Contents

UNIT- 1

Introduction to various power electronics supplies. Performance parameters for power electronics supplies and their measurement. Device selection, Control circuits. Switch mode power supplies, Square wave switching, Resonant mode operation of Power supplies , Ferroresonant, Linears and the switchers.

UNIT- 2

DC to DC Converters: Analysis and design of buck, boost, buck-boost and cuk converters, two quadrant and full bridge converters. Isolated converters i.e., flyback, forward and bridge topology. Design of d.c. inductor. Concept of integrated magnetics, converter control, averaged model, state-space model.

UNIT- 3

DC to Controlled AC: Controlled inversion, three phase full bridge inverters. 180° mode and 120° mode operation, harmonic analysis, PWM control of VSI, current mode control of PWM VSI, space vector modulation, three phase current sourced PWM CSI,

UNIT- 4

AC Choppers: Modeling and analysis of AC choppers, harmonics control using symmetrical and asymmetrical waveform pattern,

UNIT- 5

Soft switching DC to DC converters, zero current switching topologies, zero voltage switching topologies, generalized switching cell, ZCT and ZVT DC converters,

Text Books:

1. “Power Electronics Circuits”, Issa Batarseh, John Wiley & Sons Inc., 2004.
2. “Power Electronics: ”, L.Umanad, Wiley India.
3. “Power Electronics: Converters, Applications, and Design”, Ned Mohan, John Wiley & Sons Inc., 2001.
4. “Power Electronics: Devices and Circuits”, Jagannathan, PHI Learning 2012

Reference Books:

1. “Power Electronic Systems Theory and Design”, Jai P Agrawal, Pearson Education Asia, 2001.
2. “Switching Power Supply Design”, A I Pressman, McGraw Hill Publication, 1991.
3. “Handbook of Power Electronics”, M H Rashid

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PROGRAMME : BE Electrical & Electronics Engineering-VIII Semester

Course: EX8302 Advanced Communication Systems.

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Course Contents

Unit-I

Introduction to spread spectrum modulation, Direct sequence (DS) spread spectrum, Spread spectrum with code division multiple access (CDMA), Ranging, Frequency hopping (FH) spread spectrum, PN sequence generation, Acquisition and tracking of FH signal and DS signals.

Unit-II

Satellite communication: Introduction to satellite communication, Frequency allocation active/passive synchronous ,Non synchronous systems, Orbits satellite attitude, Transmission path, Path loss, noise consideration link analysis, Satellite systems effective isotropic radiated power, Multiple access methods, Earth stations, Tracking and servo system, Up-down converters, Example of satellite systems.

Unit-III

Digital switching systems: Introduction to electronics and digital exchanges, Hierarchy of switching offices,Common control push button dialing systems, Switching matrix multiple stage switching time division multiplexing time slot interchanging (TSI), Comparison of TSI with space switching, Space array for digital signals, Combined space and time switching. Principles of FAX.

Unit-IV

Mobile communication: Introduction to cellular mobile communication element of the cellular systems, Cell design, hand off techniques, Frequency Management.

Unit-V

Local access networks: Improvement in convention cables: XDSL, ADSL, Wireless local loop, Fiber in local loop, radio Trunking. ISDN: Architecture, Services and Protocols, ATM networks

References:

1. Radio Callins, Microwave communication.
2. Gagldardi, Satellite communication.
3. Thyggajan Vishwanathan, Tele Communication switching systems – PHI Learning
4. Lee, Cellular and mobile communication
5. Karmilo Fehar, Wireless digital communication. - PHI Learning

PROGRAMME : BE Electrical & Electronics Engineering-VIII Semester

Course: EX8303 FACTS

Course content

UNIT I

Basic Issues Involved in Bulk Power Transmission, Review of basics of power transmission networks-control of power flow in AC transmission line- Analysis of uncompensated AC Transmission line- Passive reactive power compensation, Principle of Transmission system compensation, Need for FACTS controllers- types of FACTS controllers and Benefits

UNIT II - STATIC VAR COMPENSATOR (SVC) and Purpose

Voltage control by SVC – Advantages of slope in dynamic characteristics- Influence of SVC on system voltage, Design of SVC voltage regulator, Modeling of SVC for power flow and stability studies, Applications- Enhancement of transient stability, Steady state power transfer, Enhancement of Power system damping, Prevention of voltage instability

UNIT III - THYRISTOR AND GTO THYRISTOR CONTROLLED SERIES CAPACITORS (TCSC and GCSC)

Concepts of Controlled Series Compensation –Analysis of TCSC-GCSC , Different modes of operation, Modeling of TCSC and GCSC for load flow studies- modeling TCSC and GCSC for stability studies- Applications of TCSC and GCSC, SSR mitigation.

UNIT IV - VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS

Static synchronous compensator(STATCOM)- Static synchronous series compensator(SSSC)- Operation of STATCOM and SSSC-Power flow control with STATCOM and SSSC- Modeling of STATCOM and SSSC for power flow studies –operation of Unified and Interline power flow controllers(UPFC and IPFC).

UNIT V - CONTROLLERS AND THEIR CO-ORDINATION

FACTS Controller interactions – SVC–SVC interaction - co-ordination of multiple controllers using linear control techniques – Quantitative treatment of control coordination.

References-

1. Mohan Mathur, R., Rajiv. K. Varma, Thyristor – Based FACTS Controllers for Electrical Transmission Systems, IEEE press and John Wiley & Sons, Inc, 2002.

2. K.R.Padiyar, FACTS Controllers in Power Transmission and Distribution, New Age International (P) Ltd., Publishers, New Delhi, Reprint, 2008.

3. A.T.John, Flexible AC Transmission System, Institution of Electrical and Electronic Engineers (IEEE), 1999.

4. NarainG.Hingorani, Laszio. Gyugyl, Understanding FACTS Concepts and Technology of Flexible AC Transmission System, Standard Publishers, Delhi, 2001.

5. V. K.Sood, HVDC and FACTS controllers- Applications of Static Converters in Power System, Kluwer Academic Publishers, 2004.

PROGRAMME : BE Electrical & Electronics Engineering-VIII Semester

Course: EX8401 Power System Economics

COURSE CONTENTS

UNIT -1

Power System Fundamentals

Regulation and Deregulation, condition for deregulation, problems with regulation, risk management, congestion management, ATC, screening curve.

Unit-2

Competetions In Power Market

What is competition, efficiency of perfect competition, marginal cost in power market, role of marginal cost, working with marginal cost, results of marginal cost.

UNIT -3

Market Power And Structure

Define market power, price quality outcomes, three stages of market power, using price quality outcomes to show power, monopoly in power auction, market power on demand side.

UNIT- 4

Restructure

Fundamental restructure system, transmission pricing, restructure models, OASIS, structure of OASIS, transfer capability of OASIS.

UNIT -5

Designing And Testing Market Rules

Design for competitive prices, testing of market design, designing to reduce market power.

REFERENCES:

1- Power system economics-designing for electricity-steven stoft. (IEEE press & WILEY-INTERSCIENCE).

2- Electric Power Systems weedy,cory, wily india 2nd edition

PROGRAMME : BE Electrical & Electronics Engineering-VIII Semester

Course: EX8402 Cellular Mobile Communications

COURSE CONTENTS

Unit-I Introduction to cellular mobile system

A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning of cellular system.

Elements of cellular radio system design

General description of problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I in an omni-directional antenna system, hand off mechanism, cell splitting, components of cellular systems.

Unit-II Cell coverage for signal and traffic

General introduction, mobile point-to-point model, propagation over water or flat open area, foliage loss, propagation in near- in distance, long distance propagation, path loss from point-to-point prediction model, cell site antenna heights and signal coverage cells, mobile-to-mobile propagation.

Cell site antennas and mobile antennas

Equivalent circuits of antennas, gain and pattern relationship, sum and difference patterns, antennas at cell site, unique situations of cell site antennas, mobile antennas.

Unit-III Cochannel interference reduction

Cochannel interference, real time cochannel interference measurement at mobile radio transceivers, design of antenna systems - omni directional and directional, lowering the antenna height, reduction of cochannel interference, umbrella- pattern effect, diversity receiver, designing a system to serve a predefined area that experiences cochannel interference.

Types of Noncochannel interference

Adjacent channel interference, near-end-far-end interference, effect on near-end mobile units, cross-talk, effects of coverage and interference by applying power decrease, antenna height decrease, beam tilting, effects of cell site components, interference between systems, UHF TV interference, long distance interference.

Unit-IV Frequency management and Channel Assignment

Frequency management, frequency spectrum utilization, setup channels, channel assignment, fixed channel assignment, non-fixed channel assignment algorithms, additional spectrum, traffic and channel assignment, perception of call blocking from the subscribers

Handoffs and dropped calls

Value of implementing handoffs, initiation of handoff, delaying a handoff, forced handoff, queuing of handoff, power- difference handoff, mobile assisted handoff and soft handoff, cell-site handoff and intersystem handoff, dropped call rate formula.

Unit-V Digital Cellular Systems

GSM- architecture, layer modeling, transmission, GSM channels and channel modes, multiple access scheme.

CDMA- terms of CDMA systems, output power limits and control, modulation characteristics, call processing, hand off procedures.

Miscellaneous mobile systems- TDD systems, cordless phone, PDC, PCN, PCS, non cellular systems.

References:

1. Lee: Cellular and Mobile Telecommunication- Analog & digital systems, TMH.
2. Rappaport: Wireless Communications- principles and practice, Pearson Education.
3. Lee: Mobile communications design fundamentals, Wiley India.
4. Faher Kamilo: Wireless Digital Communication, PHI Learning.
5. Raj Kamal: Mobile Computing, Oxford University Press.

PROGRAMME : BE Electrical & Electronics Engineering-VIII Semester

Course: EX8403 Advanced Control System

Course Contents

UNIT-I

Review of Linear Control System: Modelling through differential equations and difference equations, State space method of description and its solution, Discretization of continuous-time state space model, Laplace and z-domain analyses of control systems, Controllability, Observability & Stability, Bode & Nyquist analysis, Root Loci, Effect of load disturbance upon control actions.

UNIT-II

Development of feedback control laws through state space technique, Modal control, Pole placement problem.

UNIT-III

Variable Structure Control and its applications. Examples on variable structure control.

UNIT-IV

Control of nonlinear dynamics: Lyapunov based control function, Phase plane technique, Lyapunov Stability analysis.

UNIT-V

Optimal Control: Calculus of variation, Euler-Lagrange equations, Boundary conditions, Transversality condition, Bolza problem, Pontyagin's maximum principle.

Reference:

1. Automatic Control System – B.C. Kuo, PHI, New York, 1975.
2. Modern Control Engineering: K. Ogata,PHI. New Delhi, 1992.
3. Digital Control Systems – B. C. Kuo, Oxford Pub.
4. Discrete-Time Control Systems – K. Ogata. PHI. New Delhi
5. Advanced Control Systems N Sarkar PHI Learning
6. Control System Engineering S NISE Wiley India

Course: EX803 Major Project

GUIDELINES

The objectives of the course 'Major Project' 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 some thing 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.

EX -804 - MODELLING & 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.

REFERENCE

1. Shailendra Jain "Modeling **and Simulation** using **MATLAB Simulink"** wiley india & sons