GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER SEMICONDUCTOR DRIVES

Course Code:GR15A4022 **L T P C**
IV Year I Sem **2** 1 0 3

UNIT I

Phase controlled converter fed DC motor :introduction to thyristor cotrolled drives, single phase semi and full controlled converters d.c separately excited and d.c. series motors, continous current operation, output voltage and current waveforms, speed and torque expressions, speed torque characteristics – problems on converter fed d.c motors. Three phase semi and fully controlled converters connected to d.c separately excited and d.c series motors, output voltage and current waveforms, speed torque expressions and characteristics, problems.

UNIT II

Four quadrant operation of DC Drives: introduction to four quadrant operation, motoring operations, electric breaking-plugging, dynamic and regenerative braking operations. Four quadrant operation of D.C motors by dual converters, Closed loop operation of DC motor (Block Diagram only)

UNIT III

Control of DC motors by choppers: single quadrant , two quadrant and four quadrant chopper fed dc separately excited and series motors, continuous current operation, voltage and current waveforms, speed torque expressions and characteristics, problems, closed loop operation only(Block diagram)

UNIT IV

Control of induction motor:variable voltage characteristics – control of induction motors by AC voltage controllers, waveforms, speed torque characteristics. Variable frequency characteristics – variable frequency control of induction motor by voltage source and current source inverters .PWM control of VSI, problems on induction motor drives. Closed loop operation of induction motor drives(block diagram only). Static resistance control: slip power recovery, static scherbius drive, static Kramer drive, their performance and speed torque characteristics, advantages, applications, problems.

UNIT V

Control of synchronous motor:separate control & self control of synchronous motor operation of self controlled synchronous motors by VSI. speed torque characteristics, applications, advantages and problems, closed loop control operation of synchronous motor drives(block diagram only)

TEXT BOOKS

1. GK Dubey, Fundamentals of Electric Drives Narosa Publications

2. M.H. Rashid, Power Electronic Circuits, Devices and applications, PHI.

REFERENCES

1. MD Singh and KB Khanchandani, Power Electronics Tata Mc Graw-Hil Publishing company, 1998.

2. B.K.Bose, Modern Power Electronics and AC Drives by PHI.
3. Vedam Subramanyam, Thyristor Control of Electric drives Tata Mc Graw Hill Publications

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER SYSTEM OPERATION AND CONTROL

Course Code: GR15A4023	**L T P C**
IV Year I Sem	3 1 0 4

UNIT I

Economic Operation of Power Systems

Optimal operation of Generators in Thermal Power Stations, - heat rate Curve – Cost Curve – Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses neglected.
Optimum generation allocation including the effect of transmission line losses – Loss Coefficients, General transmission line loss formula.Numerical problems.

UNIT II

Unit commitment and economic dispatch: Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority- list methods, forward dynamic programming approach

UNIT III

Modelling of Turbine, Generator and Automatic Controllers

Modelling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.
Modelling of Generator (Steady State and Transient Models): Description of Simplified Network Model of a Synchronous Machine (Classical Model), Description of Swing Equation (No Derivation) and State-Space II-Order Mathematical Model of Synchronous Machine.
Modelling of Governor: Mathematical Modelling of Speed Governing System – Derivation of small signal transfer function.
Modelling of Excitation System: Fundamental Characteristics of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model

UNIT IV

Load Frequency Control

Necessity of keeping frequency constant.
Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case.Proportional plus Integral control of single area and its block diagram representation, steady state response.
Load frequency control of 2-area system – uncontrolled case and controlled case, tie-line bias control.Load Frequency Control and Economic dispatch control.Numerical problems.

UNIT V

Reactive Power Control

Overview of Reactive Power control – Reactive Power compensation in transmission systems: Uncompensated and compensated transmission lines: shunt and Series Compensation.– advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator.Numerical problems.

TEXT BOOKS:

1. D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis', Fourth Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2011.
2. C.L.Wadhwa, 'Power System Analysis', New Age International-6th Edition, 2010.

REFERENCES

1. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill,2011.
2. Abhijit Chakrabarti, Sunitha Halder, " Power System Analysis, Operation and Control, PHI,3/e,2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

HVDC TRANSMISSION

Course Code:GR15A4024 **L T P C**
IV Year I Sem 3 1 0 4

UNIT I

HVDC Transmission:

Introduction, equipment required for HVDC system, Comparison of AC and DC Transmission, limitations of HVDC transmission lines, reliability of HVDC systems, comparison of HVDC link with EHVAC link, HVDC converters.

UNIT II

HVDC converter operation and analysis:

Thyristors and their characteristics, silicon control rectifier, 6 pulse converter configuration, Ideal commutation process without gate control, DC output voltage, gate control of valves, analysis of voltage wave forms with overlap angle, analysis of commutating circuit, equivalent circuit of rectifier, Inverter operation with overlap, Equivalent circuit of inverter, complete equivalent circuit of HVDC link, power factor and reactive power of converters.

UNIT III

HVDC Converter Control:

AC transmission and its control, necessity of DC link control, rectifier control, inverter control, constant beta control, constant gamma control, compounding of rectifiers, current compounding of inverter, complete HVDC system characteristics, power reversal in a DC link, Voltage Dependent Current Order Limit (VDCOL), system control hierarchy, Individual phase control, cosine control of phase delay, linear control phase delay, equidistance pulse control, pulse frequency control, constant current control.

UNIT IV

Harmonics in HVDC System:

Harmonics due to converter, characteristic current harmonic in the 12 pulse converter, Harmonic model and equivalent circuit, design of AC filters, Single tune and double tune high pass filter, second order filter and C-type filter. Reactive power considerations of AC filters.

UNIT V

Faults on AC Side of Converter Station: 3-phase symmetrical faults and asymmetrical faults, commutation failure, DC circuit breaker.

Ground Electrodes for HVDC Systems: Advantage and problems with ground return, HVDC system grounding, Resistance of electrodes-Electric current filed, resistance of electrode in uniform earth and non-uniform earth, distribution of current field between electrodes.

TEXT BOOKS:

1. HVDC transmission by S Kamakshaiah and V kamaraju, Tata McGraw Hills Publications.

REFERENCES

1. Arillaga J., High Voltage Direct Transmission, (London) Peter Peregrinus, 1981.
2. K.R. Padiyar., HVDC Power Transmission Systems (English) 2nd Edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

HIGH VOLTAGE ENGINEERING
(Professional Elective-III)

Course Code: GR15A4147 **L T P C**
IV Year I Sem 3 1 0 4

UNIT I

Introduction to High Voltage Engineering: Electric Field Stresses, Gas / Vacuum as Insulator, Liquid

Di electrics, Solids and Compotes, Estimation and Control of Electric Stress, Numerical methods for electric field Computation, Surge voltages, their distribution and control, Applications of insulating materials in transformer, rotating machines, circuit breakers, cable power capacitors and bushings.

UNIT II

Break Down in Dielectric Materials: Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law. Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids. Intrinsic breakdown, electro mechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

UNIT III

Generation & Measurement of High Voltages & Currents: Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators. Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

UNIT IV

Over Voltages & Insulation Co-Ordination: Natural causes for over voltages — Lightning phenomenon, over Voltage due to switching surges, systems faults and other abnormal conditions, Principals of insulation Coordination on high voltage and Extra High Voltage power systems.

UNIT V

Testing Of Materials & Electrical Apparatus: Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements. Testing of Insulators and bushings, Testing of Isolators and circuit breakers, testing of cables, Testing of Transformers, Testing of Surge Arresters, and Radio Interference measurements.

TEXT BOOKS

1. High Voltage Engineering, M.S.Naidu and V. Kamaraju, TMH Publications.
2. High Voltage Engineering, C.L.Wadhwa, New Age Internationals (P) Limited.

REFERENCES

1. High Voltage Engineering: Fundamentals, E.Kuffel, W.S.Zaengi, J.Kuffel by Elsevier.
2. High Voltage Insulation Engineering, Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRICAL DISTRIBUTION SYSTEMS
(Professional Elective-III)

Course Code: GR15A4026 **L T P C**
IV Year I Sem 3 1 0 4

UNIT I

Distribution system planning: Introduction to distribution system, Distribution system planning, Factors effecting the system planning, Load modeling and characteristics: Coincidence factor, contribution factor, Loss factor,Relationship between the load factor and loss factor. Load growth, Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

UNIT II

Design Considerations of primary systems: Distribution feeders, Types of feeders, primary feeder voltage levels, feeder loading, Radial feeders with uniformly and non uniformly distributed loads, Applications of general circuit constants to radial feeders.
Design Considerations of secondary systems: Secondary voltage levels, secondary banking, one line diagram of secondary network system, secondary mains, limiters, network protectors.

UNIT III

Distribution Substations: Substation bus schemes, substation location, Rating of distribution substation, substation service area with 'n' primary feeders, comparison of 4&6 feeder patterns.
Supervisory control& data acquisition system(SCADA): Substation functions by SCADA, advanced SCADA concepts

UNITIV

Distribution system Protection: Objectives of distribution system protection, over current Protective Devices-Fuses, Automatic Circuit Re-closer, Automatic Line sectionalizers and Automatic circuit breakers.
Coordination of protective devices: Objectives of co-ordination, general coordination procedure, Fuse to Fuse coordination, Re-closer to fuse coordination, fuse to circuit breaker coordination, Re-closer to circuit breaker coordination.

UNITV

Applications of capacitors to Distribution systems: Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), effect of series capacitors, Power factor correction,Applications of capacitors,capacitor allocation- Economic justification of capacitors, Procedure to determine the optimum capacitor location.

Distribution system Voltage Control: Importance of voltage control, methods of voltage control, Equipment for voltage control, AVB/ AVR for voltage control, Line drop compensation, voltage fluctuations.

TEXT BOOKS:

1. Turan Gonen, Electric Power Distribution system Engineering– CRC Press.

2. V.Kamaraju, Electrical Power Distribution Systems, Tata McGraw-Hill Publishing company,

REFERENCES

1. G. RamMurthy, Electrical Power Distribution hand book, University press.

2. A.S.Pabla, Electric Power Distribution, Tata McGraw-Hill Publishing company

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PRINCIPLES OF SIGNAL PROCESSING
(Professional Elective-III)

Course Code: GR15A4148 **L T P C**
IV Year I Sem 3 1 0 4

UNIT I

SIGNAL TRANSMISSION THROUGH LINEAR SYSTEM: Linear System, Impulse Response, Response of a linear system, Linear Time Invariant (LTI), Transfer Function of a LTI system, Filter Characteristics of linear systems, Distortion less transmission through a system, Physical realizability of LTI systems, Ideal LPF, HPF and BPF characteristics, Relation between input and output Power Spectral Densities, Sampling Theorem and Signal Reconstruction.

UNIT II

INTRODUCTION TO DSP: Introduction to Digital Signal Processing: Discrete time signals & sequences, linear shift invariant systems, stability, and causality. Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

DISCRETE FOURIER SERIES: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT. Relation between Z-transform and DFS

UNIT III

FAST FOURIER TRANSFORMS: Fast Fourier transforms (FFT) – Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT, and FFT for composite N

UNIT IV

REALIZATION OF DIGITAL FILTERS: Review of Z-transforms, Applications of Z – transforms, solution of difference equations of digital filters, Block diagram representation of linear constant-coefficient difference equations, Basic structures of IIR systems, Transposed forms, Basic structures of FIR systems, System functions.

UNIT V

IIR DIGITAL FILTERS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples: Analog-Digital transformations,

FIR DIGITAL FILTERS : Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR and FIR filters.

TEXT BOOKS:

1. Salivahana and Gnanapriya , " Digital Signal Processing" , TMH 2nd edition.
2. Ramesh Babu , " Digital Signal Processing" , Scitech Publications, 4th edition.

REFERENCES

1. S.K.Mitra, " Digital Signal Processing" , TMH Publication, 4th edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DSP BASED ELECTRICAL LAB

Course Code: GR15A4027 **L T P C**
IV Year I Sem 0 0 2 2

List of Experiments:

Task1: Blinking on-board LED

Task2: Watchdog with CPU Timer interrupts

Task3: Implementing a For Loop

Task4: Generation of a Square wave

Task5: Generation of a Triangular wave

Task6: Interfacing an external LED

Task7: Acquisition of signal from ADC

Task8: Initializing the GPIO

Task9: Generation of 1 kHz PWM pulses at 75% & 50% Duty cycles

Task10: Generation of 5 kHz PWM pulses at 25% Duty cycle

Task11: Generation of ePWM pulses with a dead-band

Task12: Programing in FLASH

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER SYSTEMS SIMULATION LAB

Course Code: GR15A4028 **L T P C**
IV Year I Sem 0 0 2 2

Task1: Sinusoidal Voltages and Currents

Task2: Computation of line parameters

Task3: Modelling of transmission lines

Task4: Formation of bus Admittance matrix

Task5: Load Flow solution using Gauss Siedel method.

Task6: Load Flow solution using Newton Raphson method in polar coordinates

Task7: Load Flow solution using Newton Raphson method in Rectangular coordinates

Task8: Transient stability analysis of single-machine infinite bus system

Task9: Power flow solution of 3 – bus system

Task10: a)Optimal dispatch neglecting losses

b) Optimal dispatch including losses

Task11: Three phase short circuit Analysis in a synchronous machine(Symmetrical fault Analysis)

Task12: Unsymmetrical fault Analysis: LG, LL, LLG Fault

Task13: Z–Bus Building Algorithm

Task14:a)Obtain Symmetrical Components of a set of Unbalanced currents.
b)Obtain the original Unbalanced phase voltages from Symmetrical Components.

Task15: Short circuit Analysis of a power system with IEEE 9 bus system.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER ELECTRONICS AND DRIVES LAB

Course Code: GR15A4029 **L T P C**
IV Year I Sem 0 0 2 2

Task1: Firing angle control of thyristor based DC drive connected to DC motor using LabVIEW.

Task2: Closed loop speed control of DC motor using PI,PID, PD controllers using LabVIEW.

Task3: Closed loop speed control of DC motor- generator set with load using PI,PID controllers using LabVIEW.

Task4: Step,ramp,parabolic response of second order DC motor system using LabVIEW.

Task5: Closed loop speed control of dc motor with step, ramp,parabolic inputs and PI,PID controllers using LabVIEW.

Task6: Indirect speed control of DC motor using armature voltage control with PI,PID controllers using LabVIEW.

Task7: V/F control of AC drive connected to AC motor using LabVIEW.

Task8: Closed loop speed control of AC motor using PI,PID, PD controllers using LabVIEW.

Task9: Closed loop speed control of AC motor- DC generator set with load using PI,PID controllers using LabVIEW.

Task10: Step,ramp,parabolic response of second order AC motor system using LabVIEW.

Task11: Closed loop speed control of AC motor with step, ramp,parabolic inputs and PI,PID controllers using LabVIEW.

Task12: Indirect speed control of AC motor using armature V/F control with PI,PID controllers using LabVIEW.

Task13: Closed loop torque control of DC motor with PI,PID controllers using LabVIEW.

Task14: Closed loop torque control of AC motor with PI,PID controllers using LabVIEW.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREEN BUILDING TECHNOLOGY

(Open Elective-III)

Course Code: GR15A4161	**L T P C**
IV Year I Semester	**3 1 0 4**

UNIT 1

Concept of Green Buildings:

Green building Definition, Features, Necessity,Initiatives, Green buildings in India, Green building Assessment- Green Building Rating Systems (BREEAM,USGBC,LEED,IGBC,TERI-GRIHA, GREEN STAR),Criteria for rating, Energy efficient criteria ,environmental benefits economic benefits, health and social benefits , Major energy efficiency areas for building, Contribution of buildings towards Global Warming. Life cycle cost of buildings, Codes and Certification Programs

UNITII

Sources of Energy:

Renewable and Non-renewable sources of energy ; Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources; potential of these sources, hazards, pollution; Global scenario with reference to demand and supply in India, Global efforts to reduce carbon emissions, Performance testing (new and existing): Building modeling , Energy analysis, Commissioning, Metering, Monitoring.

Carbon emission: Forecasting, Control of carbon emission, Air quality and its monitoring carbon foot print; Environmental issues, Minimizing carbon emission, Energy retrofits and Green Remodels.

UNIT III

Green Building Materials: Sustainably managed Materials,Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; Embodied Energy of Materials , Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds (VOC's), Natural Non-Petroleum Based Materials, Recycled materials,Renewable and Indigenous Building Materials, Engineering evaluation of these materials.

Green Building Planning Methods, Energy Conservation Measures in Buildings, Waste &Water management and Recycling in Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar & Daylight,Plumbing and its Effect on Energy Consumption

UNIT IV

Design of Green Buildings; Sustainable sites, Impact of building on environment, Life cycle assessment, Principles of sustainable development in Building Design ,Design on Bioclimatic **and Specifications:** Environment friendly and cost effective Building Technologies, Integrated Life cycle design of Materials and Structures, Green Strategies for Building Systems, Alternative Construction and solar passive architecture, Considerations of energy consumption, water use, and system reliability, indoor air quality, noise level, comfort, cost efficiency in building design, Advanced Green building technologies and innovations.

UNIT V

Construction of Green Buildings: Energy efficient construction, Practices for thermal efficiency and natural lighting. Eco- friendly water proofing; ECB codes building rating, Maintenance of green buildings, Cost and Performance Comparisons and Benchmarking, Green Project Management Methods and Best Practices, Cost/benefit analysis of green buildings,Life-cycle analysis of green buildings, Case studies of rated buildings (new and existing)

TEXT BOOKS:

1. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkatta Rama Reddy & K SNanjunda Rao – New Age International Publishers
2. Integrated Life Cycle Design of Structures – By AskoSarja – SPON Press
3. Non-conventional Energy Resources – By D S Chauhan and S K Sreevasthava – New Age InternationalPublishers
4. Green Buildings (McGraw hill publication): by Gevorkian
5. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design
6. Understanding Green Building Guidelines: For Students and Young Professionals, Traci Rose Rider ,W. W. Norton & Company Publisher.
7. Understanding Green Building Materials,Traci Rose Rider, W. W. Norton & Company Publisher.

REFERENCES

1. IGBC reference guide
2. Free abridged versions of LEED reference guides
3. ECBC latest version
4. US GBC's Reference Material:

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SOFT COMPUTING TECHNIQUES
(Open Elective-III)

Course Code:GR15A4162 **L T P C**
IV Year I Sem **3** 1 0 4

UNIT I

Neural Networks-I(Introduction & Architecture) Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetero-associative memory.

UNIT II

Neural Networks-II (Back propagation networks) Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting back propagation training, applications.

UNIT III

Fuzzy Logic-I (Introduction) Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT IV

Fuzzy Logic –II (Fuzzy Membership, Rules) Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

UNIT V

Genetic Algorithm(GA) Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.

TEXT BOOKS:

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications" Prentice Hall of India.
2. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.

3. N.P.Padhy,"Artificial Intelligence and Intelligent Systems" Oxford University Press.

REFERENCES

1. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India

2. P. Vas: Artificial-Intelligence-Based Electrical Machines and Drives: Application of Fuzzy, Neural, Fuzzy- Neural, and Genetic-Algorithm-Based Techniques, Oxford University Press, 1999.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPERATIONS RESEARCH
(Open Elective-III)

Course Code: GR15A4163 **L T P C**
IV B. Tech I Semester **3 1 0 4**

UNIT I

INTRODUCTION: Development – Definition– Characteristics and Phases of operations Research– Types of models – operation Research models– applications.

ALLOCATION: Linear Programming Problem Formulation – Graphical solution – Simplex method –Artificial variables techniques -Two–phase method, Big-M method – Duality Principle.

UNIT II

TRANSPORTATION MODELS: Formulation – Methods for finding feasible solution, Optimal solution, unbalanced transportation problem –Degeneracy.

ASSIGNMENT MODELS - Formulation – Optimal solution - Variants of Assignment Problem

UNIT III

SEQUENCING: Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines.

INVENTORY : Introduction – Single item – Deterministic models – Purchase inventory models with one price break and multiple price breaks – shortages are not allowed – Stochastic models – demand may be discrete variable or continuous variable – Instantaneous production. Instantaneous demand and continuous demand and no set up cost.

UNIT IV

THEORY OF GAMES: Introduction – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games – dominance principle– m X 2 & 2 X n games -graphical method.

WAITING LINES: Introduction – Single Channel – Poisson arrivals – exponential service times – with infinite population and finite population models– Multichannel – Poisson arrivals – exponential service times with infinite population single channel Poisson arrivals.

UNIT V

REPLACEMENT: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely, group replacement.

DYNAMIC PROGRAMMING: Introduction – Bellman's Principle of optimality – Applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.

TEXT BOOKS :

1. Operations Research/ Prem Kumar Gupta,Dr.D.S. Hira

2. Operations Research / S. D.Sharma-Kedarnath

3. Operation Research /J.K.Sharma/MacMilan.

REFERENCES:

1. Operations Research / R.Pannerselvam,PHI Publications.

2. Introduction to O.R /Taha/PHI

3. Operations Research / Wagner/ PHI Publications.

4. Introduction to O.R/Hiller &Libermann (TMH).

5. Operations Research /A.M.Natarajan,P.Balasubramani,A. Tamilarasi/Pearson Education.

6. Operations Research: Methods & Problems / Maurice Saseini, ArhurYaspan& Lawrence Friedman

7. O.R/Wayne L.Winston/Thomson Brooks/cole

Teaching Methodology:

Power point Presentations, Working models, white board & marker

GOKARAJU RANGARAJUINSTITUTE OF ENGINEERING AND TECHNOLOGY

MOBILE COMPUTING AND APPLICATIONS

(Open Elective III)

Course Code: GR15A4164	**L T P C**
IV Year I Semester	**3 1 0 4**

UNIT I

Introduction to Mobile Computing: Introduction, applications, simplified referenced model.

Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Comparison.

UNIT II

Telecommunication systems: GSM:Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

UNIT III

Mobility and location-based services: Introduction, Data Acquisition of Location Information, GIS, Location Information Modeling, Location-Based Services Applied, Utilizing Location-Based Services with Mobile Applications, Representing Location with UML, Security and Privacy of Location Information, Localization and Internationalization, Latest Developments in Location-Based Efforts

UNIT IV

The Mobile Development Process: Introduction, Back to the Dimensions of Mobility, Applying the Wisdom Methodology to Mobile Development, UML-Based Development Cycle for Mobile Applications

Architecture, Design, and Technology Selection for Mobile Applications: Introduction, Practical Concerns with Architectures, Architectural Patterns for Mobile Applications

UNIT V

Mobile Application Development Hurdles: Introduction, Voice User Interface Hurdles, Hurdles with Multimodal Applications, Problems with Building Location-Based Applications, Power Use.

Testing Mobile Applications: Introduction, Validating the Mobile Use Cases before Development, The Effect of the Dimensions of Mobility on Software Testing, Stress Testing and Scalability Issues, Testing Location-Based Functionality.

Support for Mobility: File systems: Consistency, coda, little work, Ficus, Mio-NFS, Rover.

Outlook: Architecture of future networks.

TEXT BOOKS

1. **Jochen Schiller**, "Mobile Communications", Second Edition, Pearson education, 2004. (Unit I-All chapters, Unit II-All chapters, & Unit V: Last two chapters)

2. **Reza B'far, "**Mobile Computing Principles: Designing And Developing Mobile Applications With UML And XML", Cambridge University Press, 2005. (Unit III-All chapters, Unit IV-All chapters and Unit V - First two chapters).

REFERENCES

1. **Adelstein, Frank, Gupta, Sandeep KS, Richard, Golden, Schwiebert, Loren,** "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw-Hill Professional, 2005.

2. **Hansmann, Merk, Nicklous, Stober**, "Principles of Mobile Computing", Springer, second edition, 2003.

3. **Martyn Mallick,** "Mobile and Wireless Design Essentials", Wiley DreamTech, 2003.

GOKARAJU RANGARAJUINSTITUTE OF ENGINEERING AND TECHNOLOGY

BUSINESS INTELLIGENCE

(Open Elective – III)

Course Code:GR15A4165 **L T P C**

IV Year I Semester **3 1 0 4**

UNIT I

Business Data and Business Intelligence: An Introduction: What is data? Data and business, Big Data, Information and insight, challenges in data decision, operational and informational data, Data decision challenge, Decision Support System, understanding Business Intelligence, Business Intelligence and its components, Importance of Business Intelligence, Business Intelligence areas, Business Intelligence Implementation, Business Intelligence and Integration Implementation, Overview of IBM Cognos BI.

UNIT II

Data warehouse: An Overview Data warehouse architecture, Data warehouse Modelling and Design, Challenges , Data Modelling requirements, Modelling Techniques; Entity relationship Modelling, Dimensional Modelling, Temporal Modelling, Multidimensional data modelling, ERM Vs MDDM, What is Metadata, Types of metadata, Benefits of metadata, Data Analytics Techniques: OLAP and OLTP systems

UNIT III

Building and Accessing a Data Warehouse: Enterprise data warehouse, Challenges of Building a Warehouse, Data warehouse for decision support system, Data Analytics, Data analytics techniques, Information Mining Vs Data mining, Usage of Data Mining, Information Integration, Data warehouse Master Data Management System, MDM Logical Architecture, DB2 UDB Warehouse

UNIT IV

IBM Cognos BI: IBM Cognos Framework Manager, Connection of Framework Manager to Cognos Business Intelligence, Framework Manager Query Model, Frame work manager Model Types, Enterprise Components, Architecture, Security, Query Modes, Model types, Framework Manager Workflow, Administration Workflow, Cognos Configuration

UNIT V

Query and Reporting: Query and Process flow, Report studio, Generation of different reports such as List, cross tab ,Charts, Prompts etc, Focus reports using prompts and filters, Drilling from one report to another, Report using Relational Data

TEXT BOOKS

1. Chuck Ballard, Dirk Herreman, Don Schau, Rhonda Bell,Data Modeling Techniques for Data Warehousing , IBM [ebook]

2. Business Analytics : Data Analytics & Decision Making by S. Christian Albright and Wayne L. Winston.
3. Analytics at Work by Morisson
4. Competing on Analytics - Davenport
5. IBM Cognos 10 Report Studio : Practical Examples by Philip & Roger
6. IBM Cognos BI 10.2 Administration Essentials by Mehmood Awan Khalid

GOKARAJU RANGARAJUINSTITUTE OF ENGINEERING AND TECHNOLOGY

PRINCIPLES OF SATELLITE COMMUNICATIONS

(OPEN ELECTIVE-III)

Course Code: GR15A04166	**L**	**T**	**P**	**C**
IV Year I Semester	**3**	**1**	**0**	**4**

UNIT-I

Introduction: Origin of satellite communications, Historical background, basic concepts of satellite communications, frequency allocations for satellite services, applications, future trends of satellite communications.

UNIT-II

Orbital Mechanics and Launchers: Orbital Mechanics look angle determination, orbital perturbations, orbit determination, launches and launch vehicles, orbital effects in communication systems performance.

UNIT-III

Satellite Subsystems: Attitude and orbital control system, Telemetry, Tracking, command and monitoring, power systems, communication subsystems, satellite antenna equipment reliability and space qualification.

UNIT-IV

Satellite Link Design: Basic transmission theory, system noise temperature and G/T ratio, design of down links, uplink design, design of satellite links for specified C/N, system design example.

UNIT-V

Earth Station Technology: Introduction, transmitters, receivers, Antennas, tracking systems, terrestrial interface, primary power test methods.

Low Earth Orbit and Geo-stationary Satellite Systems: Orbit consideration, coverage and frequency considerations, delay and throughput considerations, system considerations, operational NGSO constellation designs.

Text Books:

1. Satellite communications-Timothi Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite communications Engineering-Wilbur L.Prichard, Robert A. Nelson & Henry G. Suyderhoud, 2nd Edition, Pearson Publications, 2003.

References:

1. Satellite communications: Design principles-M. Richharia, BS publications, 2nd Edition, 2003.
2. Fundamentals of Satellite communications-K.N.Rajarao, PHI, 2004.
3. Satellite communications-Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMABLE LOGIC CONTROLLERS

Course Code: GR15A4030 **L T P C**
IV Year II Sem 2 1 0 3

UNIT I

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/0 modules.

UNIT II

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation.

Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT III

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers PLC Functions Timer functions and industrial applications counters counter function industrial applications. Architecture functions, Number comparison functions, number conversion functions.

UNIT IV

Data Handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications.

Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axis and three axis Robots with PLC, Matrix functions.

UNIT V

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing, analog output application examples. PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TEXT BOOKS

I. Programmable Logic Controllers — Principle and Applications by John W Webb and Ronald A Reiss Filth edition, PHI

2. Programmable Logic Controllers — Programming Method and Applications by JR Hackworth and ED Hackworth — Jr- Pearson, 2004.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FLEXIBLE AC. TRANSMISSION SYSTEMS
(Professional Elective-IV)

Course Code: GR15A4032 **L T P C**
IV Year II Sem 3 1 0 4

UNIT I
FACTS Concepts:
Transmission line inter connections, Power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters, basic types of FACTS controllers, benefits from FACTS controllers.

UNIT II
Voltage Source Converters:
Single phase three phase full wave bridge converters, transformer connections for 12pulse 24 and 48pulse operation.Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, comparison of current source converters with voltage Source converters.

UNIT III
Static Shunt Compensation:
Objectives of shunt compensation, midpoint voltage regulation, voltage instability prevention, improvement of transient stability, Power oscillation damping, Methods of controllable var generation, variable impedance type static var generators, switching converter type var generators, hybrid var generators.

UNIT IV
SVC and STATCOM:
The regulation and slope transfer function and dynamic performance, transient Stability enhancement and power oscillation damping, operating point control and summary of compensator control.

UNIT V
Static Series Compensation:
Concept of series capacitive Compensation, improvement of transient stability, power oscillation damping, Functional requirements, GTO Thyristor controlled series capacitor (GSC), Thyristor switched series capacitor (TSSC) and Thyristor controlled series capacitor (TCSC), control schemes for GSC, TSSC and TCSC.

TEXT BOOKS:
1. "Understanding FACTS Devices 'N.G. Hingorani and L.Guygi IEEE Press Publications 2000.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

EHV AC TRANSMISSION
(Professional Elective-IV)

Course Code: GR15A4035 **L T P C**
IV Year II Sem 3 1 0 4

UNITI
Transmission line trends and preliminary aspect standard transmission voltages – Estimation at line and ground parameters-Bundle conductor systems-Inductance and Capacitance of E.H.V. lines – Positive, negative and zero sequence impedance – Line Parameters for Modes of Propagation.

UNIT II
Electrostatic field and voltage gradients – Calculations of electrostatic field of AC lines – Effect of high electrostatic field on biological organisms and human beings - Surface voltage gradients and Maximum gradients of actual transmission lines – Voltage gradients on sub conductor.

UNIT III
Electrostatic induction in un energized lines – Measurement of field and voltage gradients for three phase single and double circuit lines – Un energized lines. Power Frequency Voltage control and over-voltages in EHV lines: No load voltage – Charging currents at power frequency-Voltage control – Shunt and Series compensation – Static VAR compensation.

UNIT IV
Corona in E.H.V. lines – Corona loss formulae- Attention of traveling waves due to Corona – Audio noise due to Corona, its generation, characteristic and limits. Measurements of audio noise radio interference due to Corona - properties of radio noise – Frequency spectrum of RI fields – Measurements of RI and RIV.

UNIT V
Design of EHV lines based on steady state and transient limits - EHV cables and their characteristics.

TEXT BOOKS:

1. EHVAC Transmission Engineering by R. D. Begamudre, New Age International (p) Ltd.

REFERENCES

1.HVAC and DC Transmission by S. Rao.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER SYSTEM AUTOMATION
(Professional Elective-IV)

Course Code: GR15A4031 **L T P C**
IV Year II Sem 3 1 0 4

UNIT I

SCADA fundamentals:Evolution of Automation Systems, SCADA in Power Systems, Advantages of SCADA in Power Systems, Power System Field, flow of data from the field to SCADA control center, open system - need and advantage, building blocks of SCADA systems, Remote terminal unit(RTU), Intelligent electronic devices(IEDs), Data concentrators and merging units.

UNIT II

SCADA Communication: SCADA communication systems, Master station, human machine interface(HMI), Building the SCADA systems, legacy, hybrid, and new systems. Classification of SCADA systems.

SCADA communication requirements, smart grid communication infrastructure, SCADA communication topologies. SCADA data communication techniques, Data communication, SCADA communication protocol architecture, evolution of SCADA communication protocol, SCADA and smart grid protocols, media for SCADA and smart grid communication. Guided, unguided(wireless) and Communication media, security and challenges for SCADA and smart grid communication.

UNIT III

Substation Automation(SA): Introduction, conventional substations, new smart devices for substation automation, the new integrated digital substation, substation automation technical issues, the new digital substation, substation automation architecture, new Vs existing substation, SA application functions, data analysis: benefits of data warehousing.

UNIT IV

Energy management systems(EMS) for control centres: Introduction, Energy control centres, EMS frame work, Data acquisition and communication(SCADA systems),general operation and management, Transmission operations and management: real time, study mode simulations, post event analysis and energy scheduling and accounting, dispatching training simulator.

UNIT V

Distribution automation and distribution management(DA/DMS)system: introduction to distribution automation, subsystems in a distribution control centre, DMS framework: integration with subsystems, MS application functions, advanced real time DMS applications, DMS coordination with other systems.

TEXTBOOKS

1. Power system SCADA and Smart Grids by Mini S.Thomas and John D. Mc Donald, CRC Press.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

MODERN POWER ELECTRONICS
(Professional Elective-V)

Course Code: GR15A4036 **L T P C**
IV Year II Sem 3 1 0 4

UNIT I

Modern power semiconductor devices: Modern power semiconductor devices- MOS turn Off Thyristor (MTO) - Emitter Turn Off Thyristor (ETO) Integrated Gate- Commutated Thyristor (IGCTs)-MOS-controlled Thyristors (MCTs)-Static Induction circuit comparison of their features.

UNITII

Resonant Pulse Inverters: Resonant pulse inverters-series resonant inverters-series resonant inverters with unidirectional switches series resonant inverters with bidirectional Switches-analysis of half bridge resonant inverter - evaluation of currents and Voltages of a simple resonant inverter-analysis of half bridge and full bridge resonant inverter with bidirectional switches

UNIT III

Multilevel Inverters: Multi level concept-Classification of multilevel inverters- Diode clamped multilevel inverter- principle of operation-main features improved diode Clamped inverter-principle of operation-Flying capacitors multilevel inverter principle of operation-main features.

UNIT IV

DC Power Supplies: DC power supplies-classification-switched mode dc power supplies-fly back Converter -forward converter- push pull converter-half bridge converter-Full bridge converter-Resonant dc power supplies-bidirectional dc power supplies-Applications.

UNITV

AC Power Supplies: AC power supplies classification-switched mode ac power supplies-Resonant AC power supplies-bi directional ac power supplies-multi stage conversions-control circuits-applications.
Introduction-power line disturbances-power conditioners-uninterruptible Power supplies-applications.

TEXT BOOKS:

1 Power Electronics—Mohammed H.Rashid Pearson Education—Third Edition

2. Power Electronics—Ned Mohan, Tore M.Undeland and William P. Robbins
—John Wiley and Sons Second Edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DSP BASED ELECTRO MECHANICAL SYSTEMS
(Professional Elective-V)

Course Code: GR15A4149	**L T P C**
IV Year II Sem	3 1 0 4

UNIT I

Introduction, Brief Introduction to Peripherals, Types of Physical Memory, Software Tools, Introduction to the C2xxDSP Core and Code Generation, The Components of the C2xx DSP Core, Mapping External Devices to the C2xx Core and the Peripheral Interface, System Configuration Registers, Memory, Memory Addressing Modes, Assembly Programming Using the C2xxDSP Instruction Set

UNITII

General Purpose Input/output (GPIO) Functionality, Pin Multiplexing (MUX) and General Purpose I/O Overview, Multiplexing and General Purpose I/O Control Registers, Using the General Purpose I/O Ports, General Purpose I/O Exercise, Introduction to Interrupts, Interrupt Hierarchy, Interrupt Control Registers, Initializing and Servicing Interrupts in Software, 5 Interrupt Usage Exercise,

UNITIII

ADC Overview, Operation of the ADC, Analog to Digital Converter Usage Exercise, Overview of the Event Manager, Event Manager Interrupts, General Purpose(GP) Timers, Compare Units, Capture Units and Quadrature Encoded Pulse (QEP) Circuitry, General Event Manager Information, Exercise: PWM Signal Generation.

UNITIV

DSP-Based Implementation of DC-DC Buck-Boost Converters: Introduction, Converter Structure, Continuous Conduction Mode, Discontinuous Conduction Mode, Connecting the DSP to the Buck-Boost Converter, Controlling the Buck- Boost Converter, Main Assembly Section Code Description, Interrupt Service Routine, The Regulation Code Sequences,

UNIT V

DSP-Based Control of Stepper Motors: Introduction, The Principle of Hybrid Stepper Motor, The Basic Operation, The Stepper Motor Drive System, The Implementation of Stepper Motor Control System Using the, LF2407DSP, The Subroutine of Speed Control Module

TEXT BOOKS:

1. DSP based Electro –Mechanical Motion Control by – Hamid A TOLIYAT, STEVEN CAMPBELL 2004 CRC Press,llc

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED CONTROL SYSTEMS
(Professional Elective-V)

Course Code: GR15A4037 **L T P C**
IV Year II Sem 3 1 0 4

UNIT I

NON-LINEAR SYSTEMS

Definition of nonlinear systems**,** Characteristics of nonlinear systems**,**Common physical non-linearities, trajectories, phase portrait, singular points and theirclassification, limit cycle and behavior of limit cycle, Derivation of generalDescribing functions(DF), DF for different nonlinearities, Linearization by small signalanalysis (Taylor series expansion), linearization by nonlinearfeedback, linearization by inverse non-linearity

UNIT II

IDENTIFICATION OF PLANT DYNAMICS

Relay control systems-Characteristics of relays, existence of limit cycles, stability of limit cycles. Frequency domain based identification-Identification of dynamic models of plants, Off-line identification of process dynamics, On-line identification of plant dynamics. Time domain based identification-State space based identification, Identification of simple systems.

UNIT III

ADAPTIVE CONTROL

Definition of adaptive control system, functions of adaptive control, gain scheduling, model reference- Mathematical description - Direct and indirect model reference adaptive control, Multivariable systems - Stability andconvergence studies, series and parallel schemes and their industrial applications.

UNIT IV

SELF TUNING REGULATORS

Different approaches to self-tuning - Recursive parameter estimation Implicit and explicit STR - LQG self-tuning - Convergence analysis Minimum variance and pole assignment approaches to multivariable self tuning regulators.

UNIT V

Sliding mode Control

Introduction, Concept of variable - structure controller and sliding control, reachability condition, properties of sliding motion, implementation of switching control laws. Reduction of chattering in sliding and steady state mode. Some design examples of nonlinear systems.

TEXT BOOKS:

1. M. Vidyasagar, "Nonlinear Systems Analysis", 2nd Ed., Prentice Hall,1993.
2. Karl J. Astrom, B. Wittenmark, .Adaptive Control, 2nd Edition, PearsonEducation Asia, First Indian Reprint, 2001
3. A. Johnson and H. Moradi, New Identifications and Design Methods, Springer -Verlag, 2005.
4. Christopher Edwards, Sarah K. Spurgeon, .Sliding Mode control: Theory andApplication, 1998.

REFERENCES

1. Hassan K. Khalil, Nonlinear Systems, Third Edition, Prentice Hall, 2002.
2. Chalam, V.V., Adaptive Control Systems, Techniques & Applications,Marcel Dekker, Inc. NY and Basel. 1987
3. Eveleigh, V.W., Adaptive Control and Optimisation Techniques, McGraw-Hill, 1967.
4. Shankar Sastry, Marc Bodson, Adaptive Control, Prentice Hall of India (P) Ltd.,1993.
5. S. Majhi, Advanced Control Theory-Relay Feedback Approach, Cengage Asia/IndiaPvt.Ltd, 2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMABLE LOGIC CONTROLLERS LAB

Course Code: GR15A4038 **L T P C**

IV Year II Sem 0 0 2 2

List of Experiments

Task1: Different applications of Push buttons.
Task2: Working of different types of Timers.
Task3: Working of different types of Counters.
Task4: Sequential operation of ON/OFF of a set of lights.
Task5: Latching and Unlatching of a Motor.
Task6: Automatic indication of water tank level.
Task7: Traffic lights indication.
Task8: Logic Gates
Task9: Interlocking
Task10: Forward and Reverse direction control of Motors.

- **Introduction on Millenium PLC**
- **Introduction on Simens PLC**