III YEAR
I SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
POWER SYSTEM ANALYSIS

Course Code: GR22A3012 **L/T/P/C: 2/1/0/3**
III Year I Semester

Course Outcomes:
1. Develop Per Unit equivalent reactance networks of Power System.
2. Formulate the Impedance and admittance matrices necessary for Power Flow Studies.
3. Solve Power Flow equations using different numerical methods.
4. Evaluate fault currents for different types of faults and analyze short circuit studies.
5. Compare Steady state stability and Transient state stability of Power system.

UNIT I
POWER FLOW STUDIES-1
Per-Unit System of Representation, Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems. Y-bus formation by Direct Inspection Method, Numerical Problems. Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static load flow equations – Load flow solutions using Gauss Seidel Method: Acceleration Factor, Load flow solution with and without P-V buses, Algorithm and Flowchart. Numerical Load Flow Solution for Simple Power Systems (Max. 3-Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (One Iteration only) and finding Line Flows/Losses for the given Bus Voltages.

UNIT II
POWER FLOW STUDIES-2
Newton Raphson Method in Rectangular and Polar Co-Ordinates form, Load Flow Solution with and without PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods. - Comparison of Different Load flow Methods – DC load Flow.

UNIT III
FORMATION OF ZBUS
Partial network, Algorithm for the Modification of Zbus Matrix for addition of an element for the following cases: Addition of an element from a new bus and reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old buses (Derivations and Numerical Problems)-Modification of Zbus for the changes in network (Problems).

SHORT CIRCUIT ANALYSIS
Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems. Symmetrical Component Theory: Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances. Sequence Networks: Positive, Negative and Zero Sequence Networks, Numerical Problems.
Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without fault impedance, Numerical Problems.

UNIT IV
STEADY STATE STABILITY ANALYSIS
Elementary concepts of Steady State, Dynamic and Transient Stability. Description of: Steady state Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of steady state stability and Methods to improve steady state stability.

UNIT V

POWER SYSTEM TRANSIENT STABILITY ANALYSIS

Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation - Solution of Swing Equation: Point-by-Point Method and Modified Euler's method. Multi machine stability. Methods to improve Transient Stability.

Textbooks

1. C. L. Wadhwa, "Electric Power Systems", New Age International.
2. I.J.Nagrath & D.P Kothari, "Modern Power System Analysis", Tata McGraw- Hill.
3. Grainger and Stevenson, "Power System Analysis", Tata McGraw Hill.

References

1. P.Kundur, "Power System Stability and Control" McGraw Hill Education, 1994
2. Hadi Saadat, "Power System Analysis", TMH Edition.
3. A. R. Bergen and V. Vittal, "Power System Analysis", Pearson Education Inc., 1999.
4. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley, 2012.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
POWER ELECTRONICS

Course Code: GR22A3013 **L/T/P/C: 3/0/0/3**
III Year I Semester

Course Outcomes:
1. Distinguish between signal level and power level devices and familiarize about the characteristics of power electronic switching devices.
2. Illustrate the performance of controlled rectifiers and AC-DC converters.
3. Analyze the steady state performance of DC-DC choppers.
4. Explain the switching states and instantaneous outputs of voltage source inverters.
5. Interpret the performance of the AC-AC converters.

UNIT I
POWER SWITCHING DEVICES
Diode, Thyristor, MOSFET, IGBT: V-I Characteristics; R, RC, UJT firing circuits for thyristor; Line and forced commutation circuits of a thyristor; Gate drive circuits for MOSFET and IGBT.

UNIT II
AC-DC CONVERTERS
Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R-load and highly inductive load, Numerical Problems, Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape and power factor.

UNIT III
DC-DC CONVERTERS
Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage, power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output voltage. Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage, Numerical Problems.

UNIT IV
DC-AC CONVERTERS
Power circuit of single-phase voltage source inverter, switching states and instantaneous output voltage, square wave operation of the inverter, concept of average voltage over a switching cycle, bipolar sinusoidal modulation and unipolar sinusoidal modulation, modulation index and output voltage.
Power circuit of a three-phase voltage source inverter: (120-degree mode), switching states, instantaneous output voltages, average output voltages, Numerical Problems.

UNIT V
AC-AC CONVERTERS
AC Voltage controller with R and RL loads - numerical problems. Cyclo-converters: step up cyclo converters; step down cyclo converters, numerical problems.

Textbooks
1. M. H. Rashid, “Power Electronics: Circuits, Devices, and Applications”, Pearson Education India, 2009
2. P. S. Bimbhra, “Power Electronics”, Khanna Publishers.

References

1. L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.
2. B K.Bose “Modern power Electronics and AC Drives” Prentice Hall India Learning Private Limited, 2005.
3. N. Mohan and T. M. Undeland, “Power Electronics: Converters, applications and Design”, John Wiley & Sons, 2007.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
POWER DISTRIBUTION AND PROTECTION

Course Code: GR22A3014 **L/T/P/C: 3/0/0/3**
III Year I Semester

Course Outcomes:
1. Analyze the concepts of Power Distribution system.
2. Describe various substation layouts.
3. Classify various types of Protective Relays and identify their applications.
4. Summarize various protection schemes for power system components.
5. Identify reasons for the generation of over-voltages and components protections.

UNIT I
D.C. DISTRIBUTION & A.C DISTRIBUTION
Classification of DC Distribution Systems. - Comparison of DC vs. AC, Under-Ground vs. Over-Head Distribution Systems. - Requirements and Design features of Distribution Systems.
-Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed at one end and both ends (equal/unequal Voltages) and Ring Main Distributor.

Introduction of AC distribution, Single phase, 3-phase, 3 phases 4 wire system, bus bar arrangement, Selection of site for substation. Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

UNIT II
SUBSTATIONS
Classification of Substations, Comparison of Outdoor and Indoor Sub-stations, Transformer Sub-stations, Pole mounted Sub-stations, Underground Sub-stations, Equipment in a transformer sub-station and its symbols, Bus-bar Arrangements in Sub-stations, Terminal and Through Sub-stations, Key diagrams of 66/11 kV & 11 kV/400 V indoor Sub-station.

UNIT III
PROTECTIVE RELAYS
Fundamental requirements of Protective Relaying, Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays.
Relays Classification: Instantaneous, DMT and IDMT types.
Application of relays: Over current/ Under voltage relays, Direction relays, Differential Relays and Percentage Differential Relays. Universal torque equation, Distance relays: Impedance, Reactance and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison.

UNIT IV
CIRCUIT BREAKERS
Arcing phenomenon and arc interruption, DC and AC circuit breaking, restriking voltage and recovery voltage, rate of rise of recovery voltage, resistance switching, current chopping, interruption of capacitive current, Types of circuit breakers – air blast, oil, SF6, vacuum circuit breakers, MCBs, MCCBs, comparison of different circuit breakers, Rating and selection of Circuit breakers.

UNIT V
OVER VOLTAGE PROTECTION AND INSULATION COORDINATION
Over voltage due to arcing ground and Peterson coil, lightning, horn gaps, surge diverters, rod gaps,

expulsion type lightning arrester, valve type lightning arrester, ground wires, ground rods, counter poise, surge absorbers, insulation coordination, volt-time curves.

Textbooks

1. C.L.Wadhwa " Electrical Power systems :New age Publishers 7th Edition 2017.
2. D. P. Kothari and I. J. Nagrath, "Modern Power System Analysis", McGraw Hill Education, 2003.

References

1. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley, 2012.
2. Sunil S. Rao, 'Protective Switch Gear', Khanna Publishers, New Delhi, 13th Edition, 2008.
3. Badri Ram and Vishwakarma, D.N., 'Power System Protection and Switchgear', Tata McGraw Hill Publishing Company Ltd., 2nd Edition, 2011.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ELECTRICAL AND HYBRID VEHICLES
(PROFESSIONAL ELECTIVE -I)

Course Code: GR22A3015 **L/T/P/C: 3/0/0/3**
III Year I Semester

Course Outcomes:
1. Summarize the Economic Aspects of EVs compared to ICEs.
2. Explain the braking system in EVs and HEVs.
3. Identify various hybrid drive-train topologies.
4. Analyze the configuration and control of different motor drives.
5. Interpret the different possible ways of energy storage requirements in Hybrid and Electric Vehicles.

UNIT I
ENVIRONMENTAL IMPACT AND HISTORY OF MODERN TRANSPORTATION
Air Pollution and Global Warming, social and environmental importance and Impact of hybrid and electric vehicles, History of Electric Vehicles, History of Hybrid Electric Vehicles, History of Fuel Cell Vehicles.

UNIT II
BRAKING FUNDAMENTALS AND REGENERATIVE BRAKING IN ELECTRIC VEHICLES
General Description of Vehicle Movement, Vehicle Resistance, Dynamic Equation, Tire–Ground Adhesion and Maximum Tractive Effort, Power Train Tractive Effort and Vehicle Speed, Vehicle Power Plant and Transmission Characteristics, Brake Performance.
Braking Energy Consumed in Urban Driving, Importance of Regenerative Braking in Electric and Hybrid Vehicles.

UNIT III
INTRODUCTION TO ELECTRIC AND HYBRID ELECTRIC VEHICLES
Hybrid Electric Drivetrains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies; Introduction to pure EV's (BEV, FCV).

UNIT IV
ELECTRIC PROPULSION SYSTEMS
Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration, and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT V
ENERGY STORAGE REQUIREMENTS IN HYBRID AND ELECTRIC VEHICLES
Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems.

Textbooks
1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.

2. Iqbal Hussain, “Electric & Hybrid Vehicles – Design Fundamentals”, Second Edition, CRC Press, 2011.

References

1. Hybrid Vehicles and the future of personal transportation, Allen Fuhs, CRC Press, 2011.
2.Vehicle Power Management: Modelling, Control and Optimization, Xi Zhang, Chris Mi, Springer,2011.
3. James Larminie, “Electric Vehicle Technology Explained”, John Wiley & Sons, 2003.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SOLAR AND WIND ENERGY SYSTEMS
(PROFESSIONAL ELECTIVE -I)

Course Code: GR22A3016 **L/T/P/C: 3/0/0/3**
III Year I Semester

Course Outcomes:
1. Outline the fundamental concepts of solar energy.
2. Develop the design considerations of solar thermal power generation.
3. Explain the operation of power electronic converters with Photovoltaics.
4. Illustrate power generation and characteristics of wind system.
5. Analyze performance of various turbines in wind power generation.

UNIT I
SOLAR RESOURCE
Introduction, solar radiation geometry and measurement, solar day length, Estimation of solar energy availability, Hourly Global, Diffuse and Beam Radiation on Horizontal Surface under Cloudless Skies, Solar Radiation on Inclined Plane Surface.

UNIT II
SOLAR THERMAL POWER GENERATION
Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, Elementary analysis.

UNIT III
SOLAR PHOTOVOLTAIC GENERATION
Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms, Converter Control, Simulation of Power Electronics Converters with Solar PV system.

UNIT IV
PHYSICS OF WIND POWER
History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power- cumulative distribution functions.

UNIT V
WIND GENERATOR TOPOLOGIES
Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent Magnet Synchronous Generators, Power electronics converters, Simulation of Power Electronics Converters for Wind Energy systems.

Textbooks
1. Ranjan, D.P.Kothari, “Renewable Energy Sources and Emerging Technologies” 2nd edition, PHI.
2. G.D Rai “Non – Conventional Energy Resources”, 3rd Edition Khanna Publishers.

References
1. S. P. Sukhatme, “Solar Energy: Principles of Thermal Collection and Storage”, McGraw Hill, 1984.
2. G. N. Tiwari and M. K. Ghosal, “Renewable Energy Applications”, Narosa Publications, 2004.

3. B.H.Khan, “Non- Conventional Energy Resources”, 2nd edition, Tata McGraw-Hill, New Delhi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ELECTRICAL MACHINE DESIGN
(PROFESSIONAL ELECTIVE -I)

Course Code:GR22A3017 **L/T/P/C: 3/0/0/3**
III Year I Semester

Course Outcomes:
1. Explain the performance parameters of electrical machines.
2. Outline the various factors which influence the design.
3. Analyze Electrical, Magnetic and Thermal loading of Induction Machines.
4. Summarize the principles of electrical machine design and carry out a basic design of Synchronous machine.
5. Make use of software tools for Electrical Machine Design.

UNIT I
Introduction to major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.

UNIT II
Transformers Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

UNIT III
Induction Motors Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of polyphase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

UNIT IV
Synchronous Machines Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

UNIT V
Computer aided Design (CAD): Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to complex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.

Textbooks
1. A. K. Sawhney, “A Course in Electrical Machine Design”, Dhanpat Rai and Sons, 1970.
2. M.G. Say, “Theory & Performance & Design of A.C. Machines”, ELBS London.

References
1. S. K. Sen, “Principles of Electrical Machine Design with computer programmes”, Oxford and IBH Publishing, 2006.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OPERATIONS RESEARCH
(PROFESSIONAL ELECTIVE -I)

Course Code: GR22A3018 **L/T/P/C: 3/0/0/3**
III Year I Semester

Course Outcomes:
1.Apply the various linear programming techniques for optimal allocation of limited resources such as machine, material and money.
2. Solve transportation problems to minimize cost and understand the principles of assignment of jobs and recruitment policies.
3.Solve sequencing problems and to distinguish various inventory models and develop proper inventory policies
4. Apply game theory to analyze various business competitions and analyze the various waiting line oriented situations.
5. Develop optimum replacement policy and Dynamic Programming Techniques.

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 solutions; North west corner rule, Least cost entry method, Vogel's approximation method. Optimal solution; MODI method. Unbalanced transportation problem and 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 a 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 and 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.

Textbooks:

1. Operations Research - Prem Kumar Gupta and D S Hira/ S Chand Publishing/ 2015
2.Operations Research / S. D.Sharma/KedarNath RamNath Publication/2020

References:

1. Operations Research / R.Panneerselvam, 3rd Edition/PHI Publications/ 2023
2. Operations Research An Introduction - Hamdy A Taha/8 th Edition/ Prentice Hall/2006
3. Principles of Operations Research: With Applications to Managerial Decisions – Harvey M. Wagner/Prentice-Hall Operations Research/2020
4. Operations Research - Kanthi Swarup, P.K. Gupta, Man Mohan Sultan Chand & Sons/ 2019
5. Operations Research/A.M.Natarajan, P.Balasubramani,A.Tamilarasi/Pearson Education/2006

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
POWER SYSTEMS LAB

Course Code: GR22A3020 **L/T/P/C: 0/0/3/1.5**
III Year I Semester

Course Outcomes:
1. Illustrate different components related to power system protections.
2. Distinguish the characteristics of different relays.
3. Determine transmission line model parameters.
4. Make use of suitable relay for distance protection.
5. Analyze transmission line performance using appropriate transmission line model.

LIST OF EXPERIMENTS

Task-1: Characteristics of Over Current relay for Phase fault.

Task-2: Characteristics of Over Current relay for Earth fault.

Task-3: Characteristics of Induction Disc type Relay.

Task-4: Testing of Differential Relay.

Task-5: Characteristics of Over Voltage Relay.

Task-6: Characteristics of Under Voltage Relay.

Task-7: Testing of Negative sequence Relay.

Task-8: To determine Efficiency and Regulation of 3 Phase Transmission model.

Task-9: Determination of ABCD parameters for short, medium, and long lines.

Task-10: Ferranti effect of a Transmission line.

Task-11: Zones Protection using Distance Relay.

Task-12: Reactive power compensation of a Transmission line.

Textbooks
1. C.L.Wadhwa " Electrical Power systems :New age Publishers 7th Edition 2017.
2. D. P. Kothari and I. J. Nagrath, "Modern Power System Analysis", McGraw Hill Education, 2003.

References
1. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley, 2012.
2. Sunil S. Rao, 'Protective Switch Gear', Khanna Publishers, New Delhi, 13th Edition, 2008.
3. Badri Ram and Vishwakarma, D.N., 'Power System Protection and Switchgear', Tata McGraw Hill Publishing Company Ltd., 2nd Edition, 2011

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
POWER ELECTRONICS LAB

Course Code:GR22A3021 **L/T/P/C: 0/0/4/2**
III Year I Semester

Course Outcomes:
1. Choose appropriate switching devices and firing circuits based on their characteristics and application.
2. Analyze the operation of different phase-controlled converters.
3. Interpret the performance of single-phase Induction motor.
4. Evaluate the operation of Inverters and Cyclo-converters.
5. Judge the performance of AC voltage controllers through virtual platforms.

LIST OF EXPERIMENTS

Task-1: Study of Characteristics of SCR, IGBT, MOSFET.

Task-2: Analysis of Single-phase Half Controlled Converter with R-load.

Task-3: Analysis of Single-phase Fully Controlled Converter with R-load.

Task-4: Open loop analysis of Buck Converter.

Task-5: Open loop analysis of Boost Converter.

Task-6: Analysis of Single-phase Full Bridge Inverter with R & RL load.

Task-7: Analysis of Single-phase Cyclo-converter with R & RL load.

Task-8: Analysis of Three Phase Fully Controlled Converter.

In addition to the above experiments, any two from the following list shall be demonstrated.

Simulation of

Task-9: Analysis of R, RC & UJT firing circuits.

Task-10: Analysis of Single-Phase AC Voltage Controller.

Task-11: Analysis of Three Phase Half Controlled Con-verter.

Task-12: Open loop analysis of Buck-Boost Converter.

Task-13: Speed control of single-phase Induction Motor.

Textbooks

1.M. H. Rashid, “Power Electronics: Circuits, Devices, and Applications”, Pearson Education India 2009.
2. P. S. Bimbhra, “Power Electronics”, Khanna Publishers.

References

1. L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.
2. B K.Bose “Modern power Electronics and AC Drives” Prentice Hall India Learning Private Limited,2005.
3.N. Mohan and T. M. Undeland, “Power Electronics: Converters, applications and Design”, John Wiley & Sons, 2007.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MICROPROCESSORS AND MICROCONTROLLERS LAB

Course Code:GR22A3022 **L/T/P/C: 0/0/3/1.5**
III Year I Semester

Course Outcomes:
1. Illustrate the assembly level language programming to microprocessors.
2. Model circuits for interfacing different modules to microcontrollers.
3. Infer various programming languages for different microcontrollers.
4. Experiment with different types of communicating devices.
5. Test for various programs which can control different electrical components.

LIST OF EXPERIMENTS

Task-1: Program for 16-bit arithmetic operations for 8085/8086 microprocessor.

Task-2: Program for sorting an array for 8085/8086 microprocessor.

Task-3: Program for string manipulations for 8085/8086 microprocessor.

Task-4: Interfacing LED's using 8051 microcontrollers.

Task-5: Interfacing LCD & Keypad using 8051 microcontrollers.

Task-6: Interfacing DC Motor using 8051 microcontrollers.

Task-7: Switches and LED's interfacing to ATmega microcontrollers.

Task-8: LCD/OLED interfacing to ATmega microcontrollers.

Task-9: Serial Communication with ATmega microcontrollers.

Task-10: Device control using ATmega microcontrollers.

Task-11: DC Motor control using ATmega microcontrollers.

Task-12: Bluetooth interfacing with ATmega microcontrollers.

Textbooks

1.Advanced Microprocessors and Peripherals, A. K. Ray and K. M. Bhurchandani, 2nd Edition, Tata McGraw-Hill, 2006.
2. Microprocessors and Interfacing, D.V. Hall, 2nd Edition, Tata McGraw-Hill, 2006.

References

1."The 8051 Microcontroller and Embedded Systems using Assembly and C"– Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, 2nd Edition, Pearson Education, 2008.
2. Microcontrollers: Theory and Applications, Ajay V. Deshmukh, Tata McGraw-Hill Education, 2005.
3. The 8051 Microcontroller, Kenneth J. Ayala, 3rd Edition, Cengage Learning, 2010.

III YEAR
II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING

Course Code: GR22A3090 **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Outcomes:
1. Outline digital signals and reconstruction of signals through Sampling theorem.
2. Analyze Linear Shift Invariant systems using z-transform, properties of z-transform and its stability.
3. Identify the different types of Frequency domain analysis and their algorithms.
4. Distinguish between FIR and IIR Digital Filters along with their types.
5. Illustrate the advantage of optimal filter designing in estimating the signals from corrupted with noise.

UNIT I
DISCRETE-TIME SIGNALS AND SYSTEMS
Discrete time signals and systems: Sequences representation; Representation of discrete systems using difference equations, Natural Sampling Method, reconstruction of signals - aliasing; Sampling theorem and Nyquist rate.

UNIT II
Z-TRANSFORM
z-Transform, Analysis of Linear Shift Invariant systems using z-transform, Properties of z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.

UNIT III
DISCRETE FOURIER TRANSFORM
Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT: Periodicity, Circular Convolution of signals, Fast Fourier Transform Algorithm: Direct Computation of DFT, Radix-2 FFT algorithms, Implementation of FFT algorithms.

UNIT IV
DESIGN OF DIGITAL FILTERS
Design of FIR Digital filters: Window method, Frequency Sampling Method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Low-pass, Band-Pass, Band- Stop and High Pass Filters.

UNIT V
APPLICATIONS OF DIGITAL SIGNAL PROCESSING
Random Process, Stationary Random Process, Power Density spectrum, Correlation-Ergodic Process, Innovations representations of a Stationary Random Process: Rational Power Spectra, Optimal filtering using ARMA Model, Weiner Filter, Linear Mean-Square Estimation.

Textbooks
1. A.V. Oppenheim and R. W. Schafer, “Discrete Time Signal Processing”, Prentice Hall, 1989.
2. J. G. Proakis and D.G. Manolakis, “Digital Signal Processing: Principles, Algorithms And Applications”, Prentice Hall, 1997.

References
1. J. R. Johnson, “Introduction to Digital Signal Processing”, Prentice Hall, 1992.
2. D. J. DeFatta, J. G. Lucas and W. S. Hodgkiss, “Digital Signal Processing”, John Wiley & Sons, 1988.

3. L. R. Rabiner and B. Gold, “Theory and Application of Digital Signal Processing”, Prentice Hall, 1992.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SENSORS MEASUREMENTS AND INSTRUMENTATION

Course Code:GR22A3091 **L/T/P/C: 2/1/0/3**
III Year II Semester

Course Outcomes:
1. Illustrate the fundamentals and measurement of different electrical quantities.
2. Solve unknown electrical parameters using Bridges and Meters.
3. Summarize functioning of Oscilloscopes and the usage of Digital voltmeters.
4. Identify the working principles of various Sensors/Transducers.
5. Analyze usage of various Sensors/Transducers in real time applications.

UNIT I
FUNDAMENTALS OF ELECTRICAL MEASUREMENTS
Ammeters & Voltmeters PMMC & Moving Iron Instruments C.T.s and PTs Ratio and Phase angle errors. Measurement of Power and power factor. Measurement of Active and Reactive power.

UNIT II
MEASUREMENT OF ENERGY AND OTHER ELECTRICAL QUANTITIES
Single phase & Three phase energy meters, Crompton's Potentiometer, AC potentiometers. Measurement of resistance, Inductance and Capacitance by bridges: Wheatstone bridge, Kelvin Double Bridge, Maxwell's Bridge, Anderson's bridge, Desauty's Bridge, Schering Bridge Derivations only.

UNIT III
OSCILLOSCOPE AND DIGITAL VOLTMETERS
Components of Cathode Ray Oscilloscope: Time base Generator, Horizontal & Vertical Amplifier, Electrostatic Deflection. Measurement of phase and frequency. Sampling Oscilloscope, Digital Storage Oscilloscope. Digital Voltmeters- Successive Approximation, Ramp, Dual slope Integration.

UNIT IV
SENSOR FUNDAMENTAL PRINCIPLES
Sensors / Transducers, Principle, Types, Basic Requirements, Classification, Selection, Resistive type, Inductive type and Capacitive type. Linear Variable Differential Transducer (LVDT), Strain Gauge (Elementary).

UNIT V
SENSOR APPLICATIONS
Introduction and Working Principles: Flow - rate sensors: Displacement Flow Sensors, Velocity Flow Sensors, Thermistors and Thermocouples, Ultrasonic sensor, Acceleration Sensors.

Textbooks
1.A.K.Shawney, "Electrical and Electronic Measurement and Instruments", Dhanpat Rai & Sons Publications.
2. D. Patranabis, "Sensors and Transducers", PHI Publications.

References
1. S. J. Prosser, E. Lewis, "Sensors and Their Applications", CRC Press.
2. Er. R K Rajput, "Electrical Measurements and Measuring Instruments", S.Chand Publishing.
3. Ernest O Doebelin, "Measurement Systems", Mc Graw Hill Publishers.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ECONOMICS AND ACCOUNTING FOR ENGINEERS

Course Code: GR22A2004 **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Outcomes:

1. The student will be able to understand the concepts of economics and Demand concepts, elasticity, and techniques for forecast demand of products
2. The student will be able to plan the production levels in tune with maximum utilization of organizational resources and with maximum profitability.
3. To understand the types of markets, types of competition and to estimate the cost of products and decide the price of the products and services produced
4. The student will be able to analyze the profitability of various projects using capital budgeting techniques and
5. The student is able will be able prepare the financial statements and more emphasis on preparation of final accounts.

UNIT-I

Introduction & Demand Analysis: ***Definition and Scope:*** Introduction to micro, macroeconomics, Nature, and Scope of Managerial Economics. National Income and its Components - GNP, NNP, GDP, NDP ***Demand Analysis***: Demand Determinants, Law of Demand, and its exceptions. ***Elasticity of Demand***: Definition, Types, Measurement and Significance of Elasticity of Demand. ***Demand Forecasting***, Factors governing demand forecasting, methods of demand forecasting,

UNIT-II

Production & Cost Analysis: ***Production Function*** – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Laws of Returns, Internal and External Economies of Scale. ***Cost Analysis*****:** Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

UNIT-III

Markets and Forms of Business organizations: ***Types of competition and Markets***, Features of Perfect competition, Monopoly and Monopolistic Competition. ***Pricing*****:** Objectives and Policies of Pricing. Methods of Pricing. *Business:* Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises, and their types.

UNIT-IV

Capital Budgeting: Capital and its significance, Types of Capital, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value (NPV) Method and Internal Rate of Return (IRR) (simple problems) and Profitability Index (PI)

UNIT-V

Introduction to Financial Accounting: ***Accounting Concepts and Conventions*** - Double-Entry Bookkeeping. ***Accounting Cycle:*** Journal, Ledger, Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

Textbooks

1. Managerial Economics – International Edition, 2019, by Christopher Thomas (Author), S. Charles Maurice (Author), McGraw-Hill Education
2. Managerial Economics Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.
3. Managerial Economics: Analysis, Problems and Cases - P. L. Mehta, Edition, 13. Publisher, Sultan Chand, 2007.
4. Financial Accounting Paperback – 2016 by K.L.Narang S.P.Jain, Kalyani Publishers,2005.

References

1. Managerial Economics 4th Edition , W. Cris Lewis, Sudhir K. Jain, H. Craig Petersen, Pearson, 2009
2. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2009
3. Financial Accounting, 6/e, Dr S N Maheshwari, CA Sharad K Maheshwari & Dr Suneel K Maheshwari, Vikas Publishing, 2018

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MODERN POWER ELECTRONICS
(PROFESSIONAL ELECTIVE -II)

Course Code: GR22A3092 **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Outcomes:
1. Illustrate modern power semiconductor devices.
2. Interpret power electronic resonant converters in power control applications.
3. Compare the performance and control of multi-level inverters.
4. Explain the performance of DC power supplies.
5. Analyze the fundamental concepts of AC power supplies and UP.

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.

UNIT II
RESONANT PULSE INVERTERS
Resonant pulse inverters-series resonant inverters- with unidirectional & Bidirectional switches. Analysis of half bridge resonant inverter - evaluation of currents and Voltages of a simple resonant inverter-Analysis full bridge resonant inverter with bidirectional switches.

UNIT III
MULTILEVEL INVERTERS
Multilevel 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.

UNIT V
AC POWER SUPPLIES
AC power supplies classification-switched mode ac power supplies. Resonant AC power supplies-bidirectional ac power supplies-multistage conversions-control circuits-applications. Introduction-power line disturbances-power conditioners-uninterruptible Power supplies applications.

Textbooks
1. M. H. Rashid, “Power Electronics: Circuits, Devices, and Applications”, Pearson Education India, 2009.
2. P. S. Bimbhra, “Power Electronics”, Khanna Publishers.

References
1. L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.

2. B K.Bose “Modern power Electronics and AC Drives” Prentice Hall India Learning Private Limited, 2005.
3. N. Mohan and T. M. Undeland, “Power Electronics: Converters, applications and Design”, John Wiley & Sons, 2007.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HVDC TRANSMISSION SYSTEMS
(PROFESSIONAL ELECTIVE -II)

Course Code:GR22A3093 **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Outcomes:
1. Compare the differences between HVDC and HVAC transmission.
2. Analyze the rectifier and inverter commutating circuits.
3. Discuss the different control strategies.
4. Identify suitable filters to eliminate harmonics in HVDC system.
5. Explain the impact of faults on the performance of HVDC system.

UNIT I
HVDC TRANSMISSION
Introduction, equipment required for HVDC systems, Comparison of AC and DC Transmission, Limitations of HVDC transmission lines, reliability of HVDC systems, comparison of HVDC link with EHVAC link, HVDC convertors, HVDC –VSC transmission System: VSC system components, Control of Active and reactive power, Applications of VSC systems.

UNIT II
HVDC CONVERTORS OPERATION AND ANALYSIS
Thyristors and their characteristics, silicon rectifiers IGBT's ,HVDC voltage source converters principle and operation , 6 pulse convertor configuration, ideal communication process without gate control, DC output voltage , gate control of valves, analysis of voltage wave forms with overlap angle, analysis of communication circuits , 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, analysis of 12 pulse converter, power flow in HVDC links, Power flow and current control , power loss in DC systems, operation and analysis of VSC converters, VSC inverter operation , power flow in VSC-DC transmission, comparison between CSC(classical HVDC) and VSC-HVDC system.

UNIT III
HVDC CONVERTER CONTROL
AC transmission and its control , necessary 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 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, inverter exhibition angle control, constant power control, control system for HVDC converter ,inverter operation problem, control of VSC converters.

UNIT IV
HARMONICS IN HVDC SYSTEM
Harmonics due to converter, characteristic current harmonics in the 12 pulse converter ,
harmonics in VSC converter , harmonic model and equivalent circuit ,design of AC filters , single tuned and double tuned high pass filters , second order filters and C-Type filter, Reactive power considerations of AC filters , Active filters and their applications, filters with VSC-HVDC schemes.

UNIT V
FAULTS AND PROTECTION SCHEMES IN HVDC SYSTEMS
3-phase symmetrical fault and asymmetrical faults, commutation failure, DC Faults with Two-Level

VSC, DC circuit breaker, Protection against Over currents/Over voltages, Multi Terminal HVDC system: series and parallel MTDC systems and their operation and control, AC-DC system interaction short circuit rates and its effects. Advantages and Problems with ground return.

Textbooks

1. HVDC transmission by S Kamakshaiah and V Kamaraju, Tata McGraw Hills Publications.
2. K.R.Padiyar., HVDC Power Transmission System(English) 2nd edition.

References

1. Arillaga., High Voltage Direct Transmission, (London)Peter Peregrinus, 1981.
2. High Voltage Direct Current Transmission: Converters, Systems and DC Grids, Dragan Jovcic, Khaled Ahmed, Wiley Publishers, 2015.
3. Direct Current Transmission, Edward Wilson Kimbark, Vol-1, John Wiley & Sons, 1971.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ADVANCED CONTROL SYSTEMS
(PROFESSIONAL ELECTIVE –II)

Course Code: GR22A3094 **L/T/P/C:3/0/0/3**
III Year II semester

Course Outcomes:
1. Develop controllers using state feedback and pole placement techniques.
2. Analyze the stability of Linear and Nonlinear continuous time systems.
3. Examine the stability analysis of nonlinear control systems using Lyapunov method.
4. Demonstrate non-linear system behavior by phase plane and describing function methods.
5. Infer optimal control problems for linear and nonlinear systems.

UNIT I
STATE FEEDBACK CONTROLLER AND STATE OBSERVERS
Design of state feedback controller using pole placement technique, Ackerman's formula, Stability Improvements by State Feedback, Necessary and Sufficient Conditions for Arbitrary Pole Placement, Design of State Observer, Compensator Design by the Separation Principle.

UNIT II
NON-LINEAR SYSTEMS ANALYSIS
Introduction, Common Nonlinear System Behaviours, Common Nonlinearities in Control Systems, Fundamentals, Describing Functions of Common Nonlinearities, Stability Analysis by Describing Function Method, Concept of Phase Plane Analysis, Construction of Phase Portraits, System Analysis on the Phase Plane.

UNIT III
LIAPUNOV STABILITY ANALYSIS
Stability of Equilibrium State in the Sense of Liapunov, Graphical Representation of Stability, Asymptotic Stability and Instability, Sign-Definiteness of Scalar Function, Second Method of Liapunov, Stability Analysis of Linear Systems, Krasovski's Theorem, Liapunov Function Based on Variable Gradient Method

UNIT IV
DESCRIBING FUNCTION ANALYSIS
Describing Functions for Common Types of Nonlinearities, Describing Function Analysis, Stability and Limit Cycles.

Phase Plane Analysis
Analytical Methods for constructing Trajectories, Graphical Methods for constructing Trajectories, Isocline Method, Delta Method, Pell's Method, Lienard's Method, Classification of Singular Points, Phase-Plane Analysis of Linear control system, Phase-plane Analysis of Non-linear control system, Minimum Time Trajectory, Optimum Switching Curve.

UNIT V
OPTIMAL CONTROL THEORY
Introduction, Optimal control problems, Mathematical procedures for optimal control
design: Calculus of variations, Pontryagin's optimum policy, Bang-Bang Control, Hamilton-Jacobi Principle.

Textbooks
1. B. N. Sarkar, "Advanced Control Systems", PHI Learning Private Limited.

2. Hassan K Khalil, “Nonlinear Systems”, Prentice Hall Publications.

References

1. S.K Bhattacharya, “Control Systems theory and applications”, Pearson India.
2. M. Gopal, Control System Principles and Design Tata – McGraw Hill, 1997.
3. Richard C. Dorf and Robert H. Bishop, “Modern Control Systems”, Eleventh Edition, Prentice Hall, Pearson Education, 2008.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
OPERATING SYSTEMS
(PROFESSIONAL ELECTIVE –II)

Course Code: GR22A2074 **L/T/P/C: 3/0/0/3**
III Year II Semester

Course Outcomes:
1. Explain different functions and types of operating system and implement various process management concepts for maximization of CPU throughput.
2. Analyze synchronization problems and design a deadlock management scheme.
3. Optimize memory management for improved system performance.
4. Demonstrate disk management, implement disk scheduling and file system interface.
5. Describe protection and security policies for OS.

UNIT I
Operating System Overview: Objectives and functions, Computer System Architecture, Evolution of Operating Systems, System Services, System Calls, System Programs, OS Structure, Virtual machines.
Process Management: Process concepts, CPU scheduling-criteria, Algorithms with evaluation, Preemptive / Non-Preemptive Scheduling, Threads, Multithreading Models**.**

UNIT II
Concurrency: Process synchronization, Critical-section problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic problems of synchronization, Monitors.
Deadlocks: Principles of deadlock–system model, Deadlock characterization, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

UNIT III
Memory Management: Swapping, Contiguous memory allocation, Paging, Structure of the page table, Segmentation.
Virtual Memory: Demand paging, Page replacement algorithms, Allocation of Frames, Thrashing.

UNIT IV
Mass-storage Structure: Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management.
File System Implementation: Access Methods, File system structure, File system implementation, Directory implementation, Allocation methods, Free-space management.

UNIT V
Protection: Goals and Principles of Protection, Implementation of Access Matrix, Access control, Revocation of Access Rights.
Security: The Security problem, Program threats, System and network threats, Implementing security defenses.

Textbooks
1. Operating System Principles, 7th Edition by Avi Silberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.

References
1. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

2. Operating System: A Design-oriented Approach, 1st Edition b y Charles Crowley, Irwin Publishing
3. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison- Wesley
4. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
5. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill.
6. Operating Systems in depth, T. W. Doeppner, Wiley.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
POWER SYSTEMS ANALYSIS LAB

Course Code: GR22A3096 **L/T/P/C: 0/0/3/1.5**
III Year II Semester

Course Outcomes:
1. Construct Impedance and Admittance matrices using step by step procedure.
2. Solve load flow problems using a suitable numerical technique.
3. Analyze various faults in power system.
4. Determine the transient stability of a given power system.
5. Choose suitable protection scheme for transmission line protection.

LIST OF EXPERIMENTS

Task-1: Computation of line parameters.

Task-2: Formation of bus Admittance matrix.

Task-3: a) Load Flow solution using Newton Raphson method in polar coordinates.

b) Load Flow solution using Newton Raphson method in rectangular coordinates.

Task-4: Unsymmetrical fault Analysis: LG, LL, LLG Fault.

Task-5: Z–Bus Building Algorithm.

Task-6: a) Obtain Symmetrical Components of a set of Unbalanced currents.

b) Obtain the original Unbalanced phase voltages from Symmetrical Components

Task-7: Zones Protection.

Task-8: Short circuit analysis.

Task-9: Tripping sequence of protective devices.

Task-10: Transient Stability analysis.

Task-11: Power flow solution of power system model.

Task-12: Solution of Simultaneous differential equations by Modified Euler's method.

Textbooks
1. C. L. Wadhwa, "Electric Power Systems", New Age International.
2. I.J.Nagrath & D.P Kothari, "Modern Power System Analysis", Tata McGraw- Hill.

References
1. P.Kundur, "Power System Stability and Control" McGraw Hill Education, 1994.
2. Hadi Saadat, "Power System Analysis", TMH Edition.
3. A. R. Bergen and V. Vittal, "Power System Analysis", Pearson Education Inc., 1999.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
SENSORS MEASUREMENTS AND INSTRUMENTATION LAB

Course Code: GR22A3097 **L/T/P/C: 0/0/3/1.5**
III Year II Semester

Course Outcomes:
1. Identify physical and electrical quantities using Sensors/Transducers.
2. Develop basic programs for computer-controlled data acquisition, measurement, and transfer of data across the sensor network for different types of sensors.
3. Illustrate experimental data by monitoring, capturing and interpretation.
4. Examine various output configurations using measuring instruments.
5. Determine the unknown values using various types of bridges.

LIST OF EXPERIMENTS

Task-1: Voltage and Current Detection Circuitry using AT mega microcontroller.

Task-2: Temperature, Pressure and Humidity Detection Circuitry.

Task-3: Measure One-cycle data of a periodic waveform from a DSO.

Task-4: Measurement of displacement with the help of LVDT/Pot.

Task-5: Measurement of distance with the help of Ultrasonic Sensor.

Task-6: Measurement of luminous intensity with the help of Light Sensor.

Task-7: Measurement of moist level using Soil Moisture Sensor and Rainfall Sensor.

Task-8: Measurement of Power and Energy in Single phase circuit.

Task-9: Measurement of three-dimensional coordinates using Accelerometer Sensor.

Task-10: Measurement of unknown Resistance by Kelvin double Bridge.

Task-11: Measurement of unknown Inductance by Anderson's Bridge.

Task-12: Measurement of unknown Capacitance by Desauty's Bridge.

Textbooks
1. Electrical and Electronic Measurement and Instruments by A.K.Shawney Dhanpat Rai & Sons Publications.
2. Sensors and Transducers By D. Patranabis , PHI Publications.

References
1. Sensors and Their Applications XII by S. J. Prosser, E. Lewis CRC Press.
2. Electrical Measurements and Measuring Instruments, by Er. R K Rajput by S. Chand Publishing.
3. Measurement Systems by Ernest O Doebelin by Mc Graw Hill.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
MINI PROJECT

Course Code: GR22A3089 **L/T/P/C: 0/0/4/2**
III Year II Semester

Course Outcomes:
1. Make use of fundamental knowledge and practical knowledge to implement towards industries.
2. Utilizing software and design, analyze the engineering Knowledge in accordance with applicable standards.
3. Analyze project management skills and scheduling of work in stipulated time.
4. Evaluate and demonstrate the problem finding ability in Engineering Technologies.
5. Develop technical information by means of written and oral reports.