SIR C R REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA

Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,

Permanently Affiliated to JNTUK, KAKINADA

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

POWER SYSTEMS AND AUTOMATION (PS&A)

M.TECH COURSE STRUCTURE & SYLLABUS

CR24 - COURSE STRUCTURE

III Semester

S.No	Course No	Category	Course Name	P.Os	L	T	P	C	Marks
1		PE	Program Elective – V i. Energy Audit Conservation &Management ii. Smart Grid Technologies iii. Power Quality and Custom Power Devices		3	0	0	3	100
2		OE	Open Elective i. Industrial Safety ii. Artificial Intelligent Techniques iii. Optimization Techniques		3	0	0	3	100
3			Dissertation Phase - I **(to be continued and evaluated next semester)**		0	0	20	10	---
					6	0	20	16	200

OPTIMIZATION TECHNIQUES

IV Semester

S.No	Course No	Category	Course Name	T	P	C	Marks
1			Dissertation Phase-II **(continued from III semester)**	0	32	16	100
				0	32	16	100

SIR C R REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA
Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,
Permanently Affiliated to JNTUK, KAKINADA

III-Semester	Energy Audit Conservation& Management (Program Elective-V)	CATEGORY	L-T-P 3-0-0	CREDITS 3

Pre-requisite: Electrical power systems and measurements.

Course Educational Objectives:

- To learn the basics of energy audit and energy conservation schemes.
- To comprehend the principles of energy management and understand the need of energy efficient motors and lighting design practices.
- To learn about power factor improvement techniques and energy instruments.
- To learn about the economic aspects o\f energy equipment.

UNIT– 1
Basic Principles of Energy Audit
Energy audit- definitions, concept , types of audit, energy index, cost index ,pie charts, Sankey diagrams and load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT– 2
Energy Management
Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting. Energy manager, qualities and functions, language, Questionnaire – check list for top management.

UNIT– 3
Energy Efficient Motors and Lighting
Energy efficient motors, factors affecting efficiency, loss distribution, constructional details, characteristics – variable speed , variable duty cycle systems, RMS - voltage variation-voltage unbalance- over motoring-motor energy audit. lighting system design and practice, lighting control, lighting energy audit.

UNIT– 4
Power Factor Improvement and energy instruments
Power factor – methods of improvement, location of capacitors, Power factor with non-linear loads, effect of harmonics on P.F, P.F motor controllers – Energy Instruments- watt meter, data loggers, thermocouples, pyrometers, lux meters, tongue testers, application of PLC's.

UNIT– 5
Economic Aspects and their computation
Economics Analysis depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, lifecycle costing analysis – Energy efficient motors. Calculation of simple payback method, net present value method- Power factor correction, lighting – Applications of life cycle costing analysis, return on investment.

SIR C R REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA
Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,
Permanently Affiliated to JNTUK, KAKINADA

Course Outcomes: At the end of the course, student will be able to

- Understand the principle of energy audit and their economic aspects.
- Recommend energy efficient motors and design good lighting system.
- Understand advantages to improve the power factor.
- Evaluate the depreciation of equipment.

Text Books:

1. Energy management by W.R.Murphy&G.Mckay Butter worth, Heinemann publications, 1982.
2. Energy management hand book by W.CTurner, John Wiley and sons, 1982.

Reference Books:

1. Energy efficient electric motors by John.C.Andreas, Marcel Dekker Inc Ltd-2nd edition,1995
2. Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998
3. Energy management and good lighting practice : fuel efficiency- booklet12-EEO

SIR C R REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA

Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,

Permanently Affiliated to JNTUK, KAKINADA

III-Semester	SMART GRID TECHNOLOGIES (ELECTIVE–V)	CATEGORY	L-T-P 3 -0-0	CREDITS 3

Pre-requisite: Basic knowledge on smart concept communication protocols, renewable energy systems and electronic circuits.

Course Educational Objectives:

- To understand concept of smart grid and developments on smart grid.
- To understand smart grid technologies and application of smart grid concept in hybrid electric vehicles etc.
- To have knowledge on smart substations, feeder automation and application for monitoring and protection.

UNIT – 1

Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient &Self-Healing Grid, Present development & International policies on Smart Grid. Case study of Smart Grid.

UNIT – 2

Smart Grid Technologies: Part 1: Introduction to Smart Meters, Real Time Pricing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Phase Shifting Transformers.

UNIT – 3

Smart Grid Technologies: Part 2: Smart Substations, Substation Automation, Feeder Automation. Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU).

UNIT – 4

Micro grids and Distributed Energy Resources: Concept of micro grid, need & applications of microgrid, formation of microgrid, Issues of interconnection, protection & control of microgrid. Plastic & Organic solar cells, Thin film solar cells, Variable speed wind generators, fuel cells, microturbines, Captive power plants, Integration of renewable energy sources.

UNIT – 5

Power Quality Management in Smart Grid: Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

Information and Communication Technology for Smart Grid: Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighbourhood Area Network (NAN), Wide Area Network (WAN).

SIR C R REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA
Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,
Permanently Affiliated to JNTUK, KAKINADA

Course Outcomes: At the end of this course, the students will be able to:

- Understand smart grids and analyze the smart grid policies and developments in smart grids.
- Develop concepts of smart grid technologies in hybrid electrical vehicles etc.
- Understand smart substations, feeder automation, GIS etc.
- Analyze micro grids and distributed generation systems.
- Analyze the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.

Text Books:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai "Integration of Green and Renewable Energy in Electric Power Systems", Wiley
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press

Reference Books:

1. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, AkihikoYokoyama, "Smart Grid: Technology and Applications", Wiley
2. Jean Claude Sabonnadière, NouredineHadjsaïd, "Smart Grids", Wiley Blackwell 19
3. Peter S. Fox Penner, "Smart Power: Climate Changes, the Smart Grid, and the Future of Electric Utilities", Island Press; 1 edition 8 Jun 2010
4. S. Chowdhury, S. P. Chowdhury, P. Crossley, "Microgrids and Active Distribution Networks." Institution of Engineering and Technology, 30 Jun 2009
5. Stuart Borlase, "Smart Grids (Power Engineering)", CRC Press
6. Andres Carvallo, John Cooper, "The Advanced Smart Grid: Edge Power Driving Sustainability: 1", Artech House Publishers July 2011

SIR C R REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA

Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,

Permanently Affiliated to JNTUK, KAKINADA

III-Semester	POWER QUALITY AND CUSTOM POWER DEVICES (ELECTIVE–V)	CATEGORY	L-T-P 3 -0-0	CREDITS 3

Pre requisite: Knowledge on electric circuit analysis, power systems and power electronics and concept of reactive power compensation techniques.

Course Educational Objectives:

- To understand significance of power quality and power quality parameters.
- To know types of transient over voltages and protection of transient voltages.
- To understand harmonics, their effects, harmonic indices and harmonic minimization techniques.
- To understand the importance of power devices and their applications.
- To understand different compensation techniques to minimize power quality disturbances.

UNIT– 1

Introduction to power quality: Overview of Power Quality, Concern about the Power Quality, General Classes of Power Quality Problems, Voltage Unbalance, Waveform Distortion, Voltage fluctuation, Power Frequency Variations, Power Quality Terms, Voltage Sags, swells, flicker and Interruptions - Sources of voltage and current interruptions, Nonlinear loads.

UNIT– 2

Transient and Long Duration Voltage Variations: Source of Transient Over Voltages - Principles of Over Voltage Protection, Devices for Over Voltage Protection, Utility Capacitor Switching Transients, Utility Lightning Protection, Load Switching Transient Problems.
Principles of Regulating the Voltage, Device for Voltage Regulation, Utility Voltage Regulator Application, Capacitor for Voltage Regulation, End-user Capacitor Application, Regulating Utility Voltage with Distributed generation.

UNIT– 3

Harmonic Distortion and solutions: Voltage vs. Current Distortion, Harmonics vs. Transients - Power System Quantities under Non-sinusoidal Conditions, Harmonic Indices, Sources of harmonics, Locating Sources of Harmonics, System Response Characteristics, Effects of Harmonic Distortion, Inter harmonics, Harmonic Solutions Harmonic Distortion Evaluation, Devices for Controlling Harmonic Distortion, Harmonic Filter Design, Standards on Harmonics.

UNIT– 4

Custom Power Devices: Custom power and custom power devices, voltage source inverters, reactive power and harmonic compensation devices, compensation of voltage interruptions and current interruptions, static series and shunt compensators, compensation in distribution systems, interaction with distribution equipment, installation considerations.

SIR C R REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA
Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,
Permanently Affiliated to JNTUK, KAKINADA

UNIT– 5

Application of custom power devices in power systems: Static and hybrid Source Transfer Switches, Solid state current limiter - Solid state breaker. P-Q theory – Control of P and Q, Dynamic Voltage Restorer (DVR): Operation and control – Interline Power Flow Controller (IPFC): Operation and control of Unified Power Quality Conditioner (UPQC); Generalized power quality conditioner

Course Outcomes: At the end of the course, student will be able to

- Identify the issues related to power quality in power systems.
- Address the problems of transient and long duration voltage variations in power systems.
- Analyze the effects of harmonics and study of different mitigation techniques.
- Identify the importance of custom power devices and their applications.
- Acquire knowledge on different compensation techniques to minimize power quality disturbances.

Text Books:

1. Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw-Hill, 2002.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M H J, First Edition, IEEE Press; 2000.
3. Guidebook on Custom Power Devices, Technical Report, Published by EPRI, Nov 2000
4. Power Quality Enhancement Using Custom Power Devices – Power Electronics and Power Systems, Gerard Ledwich, ArindamGhosh, Kluwer Academic Publishers, 2002.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw-Hill, 2000.
2. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
3. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
4. Power Quality c.shankaran, CRC Press, 2001
5. Harmonics and Power Systems –Franciso C.DE LA Rosa-CRC Press (Taylor & Francis).
6. Power Quality in Power systems and Electrical Machines-EwaldF.fuchs, Mohammad A.S. Masoum-Elsevier
7. Power Quality, C. Shankaran, CRC Press, 2001
8. Instantaneous Power Theory and Application to Power Conditioning, H. Akagiet.al., IEEE Press, 2007.
9. Custom Power Devices - An Introduction, ArindamGhosh and Gerard Ledwich, Springer, 2002
10. A Review of Compensating Type Custom Power Devices for Power Quality Improvement, Yash Pal et.al., Joint International Conference on Power System Technology and IEEE Power India Conference, 2008. POWERCON 2008.

SIR C R REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA
Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,
Permanently Affiliated to JNTUK, KAKINADA

III-Semester	INDUSTRIAL SAFETY (OPEN ELECTIVE)	CATEGORY	L-T-P 3 -0-0	CREDITS 3

Pre-requisite: Engineering Fundamentals

Course Educational Objectives:

- To learn safety aspects of any industrial area
- To learn fundamentals and types of maintenance engineering
- To learn causes and effects of wear and Corrosion and their prevention
- To learn identification of faults and their repair
- To learn preventive maintenance- periodic an preventive-maintenance of industrial systems

UNIT– 1

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety colour codes. Fire prevention and fire fighting, equipment and methods.

UNIT– 2

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT– 3

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications**,** i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT– 4

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT– 5

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of:
i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

SIR C R REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA
Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,
Permanently Affiliated to JNTUK, KAKINADA

Course Outcomes: At the end of the course, the student should be able to

- Understand the general industrial requirements like lighting, cleanliness prevention from hazards and accidents.
- Analyze maintenance requirements of the industry and cost associated.
- Analyze wear and corrosion aspects of the industry and their prevention.
- Identify the faults prone areas and their repair and periodic maintenance.

Reference Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

SIR C R REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA
Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,
Permanently Affiliated to JNTUK, KAKINADA

III-Semester	ARTIFICIAL INTELLIGENT TECHNIQUES (OPEN ELECTIVE)	CATEGORY	L-T-P 3 -0-0	CREDITS 3

Pre–requisite: Fundamentals of Neural networks and Fuzzy Logic.

Course Educational Objectives:

- To have knowledge on concept of neural network.
- To know different types of neural networks and training algorithms.
- To understand the concept of genetic algorithm and its application in optimization.
- To have the knowledge on fuzzy logic and design of fuzzy logic controllers.
- To know the applications of AI Techniques in electrical engineering.

UNIT– 1

Introduction

Artificial Neural Networks (ANN) – definition and fundamental concepts – Biological neural networks – Artificial neuron – activation functions – setting of weights – typical architectures – biases and thresholds – learning/training laws and algorithms. Perceptron – architectures, ADALINE and MADLINE – linear separability- XOR function.

UNIT– 2

ANN Paradigms

ADALINE – feed forward networks – Back Propagation algorithm- number of hidden layers – gradient decent algorithm – Radial Basis Function (RBF) network. Kohonen's self organizing map (SOM), Learning Vector Quantization (LVQ) and its types – Functional Link Networks (FLN) – Bidirectional Associative Memory (BAM) – Hopfield Neural Network.

UNIT– 3

Classical and Fuzzy Sets and Fuzzy Logic Controller (FLC)

Introduction to classical sets- properties, Operations and relations; Fuzzy sets, Membership, Operations, Properties, Fuzzy relations, Cardinalities, Membership functions. Fuzzy logic system components: Fuzzification, Inference engine (development of rule base and decision making system), Defuzzification to crisp sets- Defuzzification methods.

UNIT– 4

Basic machine learning algorithms

Gradient Descent, Linear Regression, Logistic Regression, Bayes Theorem and Bayesian Learning, Maximum Likelihood and Least-Squared Error Hypothesis, Bayes Optimal Classifier, Naive Bayes Classifier, Learning to Classify Text, Bayesian Belief Network, K-Means clustering.

UNIT– 5

Application of AI Techniques

Speed control of DC motors using fuzzy logic –load flow studies using back propagation algorithm, single area and two area load frequency control using fuzzy logic. Application of Basic Machine learning algorithms to Power Systems, Smart Grids.

.

SIR C R REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA
Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,
Permanently Affiliated to JNTUK, KAKINADA

Course Outcomes: At the end of the course, student will be able to

- Differentiate between Algorithmic based methods and knowledge based methods.
- Use appropriate AI framework for solving power system problems.
- To design fuzzy logic controllers for power engineering applications.

Text Books:

1. Introduction to Artificial Neural Systems - Jacek M. Zurada, Jaico Publishing House, 1997.
2. Fuzzy logic with Fuzzy Applications – T.J Ross – McGraw Hill Inc, 1997.
3. Machine Learning- Tom M Mitchell- Indian Edition – Tata McGraw Hill.

Reference Books:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by RajasekharanandPai – PHI Publication.
2. Modern power Electronics and AC Drives – B.K.Bose -Prentice Hall, 2002.
3. Genetic Algorithms- David E Goldberg. Pearson publications.
5. Introduction to Neural Networks using MATLAB 6.0 by S.N.Sivanandam,SSumathi,S N Deepa TMGH.
6. Introduction to Fuzzy Logic using MATLAB by SN.Sivanandam,SSumathi,S N Deepa Springer, 2007.

SIR C R REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA

Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,

Permanently Affiliated to JNTUK, KAKINADA

III Semester	OPTIMIZATION TECHNIQUES	CATEGORY	L-T-P 3-0-0	CREDITS 3

Pre –requisite: Engineering Mathematics

Course Educational Objectives:

- To understand the mathematical modeling of physical systems and its solving techniques with and without constraints.
- To understand the solving of Liner Programming using simplex method and revised simplex method.
- To understand the unconstrained and constrained optimization methods
- To understand the scheduling and sequencing problem of different models with sequential quadratic programming.
- To understand Evolutionary Programming.

UNIT– 1

Introduction to Optimization: Introduction, Historical Development, Engineering Applications of Optimization, Statement of Optimization Problem.

UNIT– 2

Classical Optimization Techniques: Introduction, Single variable optimization, Multivariable optimization with no constraints; Multivariable optimization with Equality constraints – Solution by Direct Substitution method, Method of constrained variation, Method of Lagrangian multipliers; Multivariable optimization with inequality constraints: Kuhn-Tucker conditions. Applications to Simple Power System Problems.

UNIT– 3

Linear Programming: Introduction, Applications of Linear Programming, Standard Form of a Linear Programming, Basic Terminology and Definitions, Exceptional cases, Simplex method, Big-M method, Two-phase method, Revised Simplex method, Duality, Decomposition Principle. Applications to Unit Commitment problem.

UNIT– 4

Nonlinear Programming: Unconstrained optimization-Univariate method, Pattern Directions, Hook and Jeeves Method, Powell's method, Gradient of a function, Steepest descent method, Conjugate Gradient Method, Newton's method**.** Constrained optimization- Characteristics of a Constrained Problem, Sequential linear programming.

UNIT– 5

Evolutionary Programming: Introduction of Evolutionary Programming, Particle Swarm Optimization, Differential Evolution and Evolutionary Programming, Applications to Power systems.

SIR C R REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA
Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,
Permanently Affiliated to JNTUK, KAKINADA

Course Outcomes: At the end of the course, student will be able to

1. Understand Classical Optimization technique.
2. Apply linear programming to power systems.
3. Analyze constrained and unconstrained optimization techniques.
4. Implement Evolutionary algorithms to Power Systems.

TEXT BOOK:

1. Engineering Optimization: Theory and Applications' By S. S. Rao, New Age International Publishers, Revised Third Edition, 2005.
2. Evolutionary computation: Kenneth De Jong-MIT Press-2016.

REFERENCES:

1. Problems and Solutions in Optimization by Willi-Hans Steeb.
2. Optimization Methods for Engineering Design Applications and Theory Alan R. Parkinson, Richard J. Balling, John D. Hedengren **.**
3. An Introduction to Optimization: Foundations and Fundamental Algorithms Niclas Andr´easson, Anton Evgrafov, and Michael Patriksson**.**

SIR C R REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA

Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,

Permanently Affiliated to JNTUK, KAKINADA

III SEMESTER	**DISSERTATION PHASE-I**	**CATEGORY**	**L-T-P** **0-0-20**	**CREDIT** **10**

SIR C R REDDY COLLEGE OF ENGINEERING

(AUTONOMOUS)

VATLURU, ELURU-534007, ELURU DIST., ANDHRA PRADESH, INDIA

Approved by AICTE, Accredited by NAAC with 'A' Grade & NBA,

Permanently Affiliated to JNTUK, KAKINADA

IV SEMESTER	DISSERTATION PHASE-II	CATEGORY	L-T-P 0-0-32	CREDIT 16