ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::RAJAMPET
(AN AUTONOMOUS INSTITUTION)

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IV B. Tech., I Semester

7G283-RENEWABLE ENERGY SOURCES
(PROFESSIONALELECTIVE-II)

Course Objective: To create awareness among the students about the different types of Renewable Energy sources and emphasize its importance.

Unit I

PRINCIPLES OF SOLAR RADIATION: Conventional energy sources-classification, advantages, limitations, comparison of conventional and non-conventional energy sources; Role and potential of new and renewable source, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation geometry, solar radiation on tilted surface, instruments for measuring solar radiation-pyranometer, pyrheliometer and sun shine recorder, solar radiation data.

Unit II

Solar energy collection and its applications: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

Energy Storage :necessity of energy storage methods-, Sensible, latent heat and thermo chemical storage.

Solar Applications- solar heating/cooling technique, solar distillation, solar ponds and drying, photovoltaic energy conversion.

Unit III

WIND ENERGY

Introduction, Wind and its Properties, site selection consideration, Basic principles of Wind Energy Conversion Systems (WECS),Parts of WECS, types of wind machines Classification of WECS, modes of wind power generation, Derivation for Power in the wind, energy storage, performance characteristics of wind machines, applications , Advantages and Disadvantages of WECS.

Unit IV

OCEAN ENERGIES: OTEC energy: Introduction to thermal energy conversion, working principle-closed rankine cycle OTEC system, advantages and disadvantages.

Tidal energy: tidal characteristics, tidal energy estimation, types of tidal power plants, advantages and disadvantages.

Wave energy: Factors affecting wave energy, wave energy conversion machines, mini-hydel power plants.

Unit V

BIO-MASS AND GEOTHERMAL ENERGY: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas and economic aspects.

Geothermal Energy: Geothermal field, Resources, types of wells, methods of harnessing the energy, potential in India

TEXT BOOKS:

1. G.D. Rai. *Non-Conventional Energy Sources*. Khanna Publishers, Delhi, 2007.
2. Khan B.H., *Non-Conventional Energy Resources*, Tata McGraw Hill, New Delhi,2006

REFERENCE BOOKS:

1. Twidell & Wier, *Renewable Energy Resources* , CRC Press(Taylor & Francis)
2. Ramesh & Kumar, *Renewable Energy Technologies* , Narosa.
3. K Mittal, Non-*Conventional Energy Systems*, Wheeler

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V B. Tech., II Semester

7G286-RELIABILITY ENGINEERING & APPLICATIONS TO POWER SYSTEMS

(PROFESSIONAL ELECTIVE-III)

Course objective:

The course is aimed to perform reliability assessment for electrical power systems. It's a tool for decision support for planning and operation of the electric power system. The goal for the course is to give the participants knowledge on how to use reliability analysis as a tool for decision support during design, operation and maintenance of electric power systems.

Unit I

Elements of probability theory: Probability distributions: Random variables, density and distribution functions, Mathematical expectation- Mean and Variance, Binominal distribution, Poisson distribution, Normal .distribution, Exponential distribution, Weibull distribution.

Unit II

Definition of Reliability: Component reliability, Hazard rate, derivation of the reliability functions in terms of the hazard rate. Causes of failures, types of failures. Bath tub curve, MTTR, MTBF. Reliability logic diagrams for series, parallel, series-parallel, non-series- parallel I configurations. Minimal cut-set and decomposition methods.

Unit III

Discrete Markov Chains: General modeling concepts, stochastic transitional probability matrix, time dependent probability evaluation and limiting state probability evaluation. Absorbing states. Continuous Markov Processes: Modeling concepts, State space diagrams, Stochastic Transitional Probability Matrix, Evaluating limiting state Probabilities. Reliability evaluation of repairable systems.

Unit IV

Generating System Reliability Analysis :Generation system model- capacity outage probability tables -Recursive relation for capacitive model building sequential addition method -unit removal- Evaluation of loss of load and energy indices. Frequency and Duration methods- Evaluation of equivalent transitional rates of identical and non- identical units -Evaluation of cumulative probability and cumulative frequency of non- identical generating units -2'-level daily load representation - merging generation and load models

Unit V

Distribution System Reliability Analysis: Radial networks –Evaluation of Basic reliability indices, performance indices -load point and system reliability indices - customer oriented, loss and energy oriented indices. Parallel networks- inclusion of bus bar failures, scheduled maintenance -temporary and transient failures - weather effects - common mode failures-Evaluation of various indices.

TEXT BOOKS :

1. Roy Billinton and Ronald N Allan, "*Reliability Evaluation of Engineering Systems* ", Plenum Press.
2. Roy Billinton and Ronald N. Allan, "*Reliability Evaluation of Power Systems*" Plenum Press, New York and London (Second Edition), 1996.
3. J.Endrenyi, "*Reliability Modeling in Electric Power Systems*", John Wiley and Sons, 1978. (First Edition)

REFERENCE BOOKS:

1. Charles E. Ebeling. *An Introduction to Reliability and Maintainability Engineering.* TATA McGraw -Hill Edition, 2000.
2. LS Sainath. *Reliability Engineering.* 3rd Edition, Affiliated East West Pvt. Ltd., 1991.
3. BalaguruSwamy. *Reliability Engineering.* TATA Mc Graw Hill Edition. 1984.

Course outcomes: By the end of this course, students will be able to

1. Understand the fundamental definitions and concepts of reliability assessment
2. Analyze techniques for reliability assessment of the system
3. Network modelling
4. Markov modelling
5. Generation system reliability analysis
6. Lifetime models

COs-POs-PSOs Mapping Table

Course Outcomes	Program Outcomes												PSOs	
	1	2	3	4	5	6	7	8						

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IV B. Tech., II Semester

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7G288-ENERGY AUDITING AND DEMAND SIDE MANAGEMENT (PROFESSIONAL ELECTIVE-IV)

Prerequisites: Courses on Electrical Measurements and Transmission & Distribution.

Course Objective: Principles of energy conservation, audit and management; Energy efficient motors, lighting, economics.

Unit I

Energy Audit And Management Principles: Energy audit - definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, energy conservation schemes - energy audit of industries energy saving potential, energy audit of process industry, building energy audit.

Unit II

Energy Conservation Principles: Rules for efficient energy conservation - technologies for energy conservation - Energy scenario, principles of energy conservation, resource availability, energy savings, and current energy consumption in India, roles and responsibilities of energy managers in industries.

Unit III

Energy Efficient Motors And Lighting: Energy efficient motors - factors affecting efficiency, loss distribution, constructional details, characteristics, variable speed, variable duty cycle systems, motor energy audit. Lighting: Good lighting system design and practice, lighting control, lighting energy audit.

Unit IV

Energy Instruments And Economic Analysis: Energy Instruments- watt meter, data loggers, thermocouples, pyrometers, lux meters, tongue testers, PLCs and applications.

Energy Economic Analysis- The time value of money concept. Cash flow models, payback analysis, depreciation, taxes and tax credit - numerical problems.

Unit V

Demand Side Management: Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM - time of day pricing, multi-utility power exchange model, and time of day models for planning. Load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation, energy efficient equipment. Management and organization of energy conservation awareness programs.

TEXT BOOKS:

1. W.R. Murphy & G. Mckay Butter worth, Energy management, Butter worth-Heinemann publications, 2nd edition, 2016.
2. Albert Thumann, William J. Younger, Handbook of energy audits, Taylor & Francis Ltd, 7th edition, 2008.
3. Umesh Rathore, Energy management, S.K. Kataria & Sons, 2nd edition, 2014.

REFERENCE BOOKS:

1. W.C.Turner,Stevedoty, Energy management hand book, CRC press, 6th edition, 2006. 2. D.P. Sen, K.R. Padiyar, IndraneSen, M.A. Pai, Recent Ad vances in Control and Management of Energy Systems, In terline Publisher, Bangalore, 1993.
2. Ashok V. Desai, Wiley Eastern, Energy Demand - Analysis, Management and Conservation Hand book on energy auditing - TERI (Tata Energy Research Institute), 2005.
2. Craig B. Smith, Kelly E. Parmenter, Energy management principles Applications, benefits, Savings, Elsevier Inc(Pergamon Press), 1st edition, 2016.

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

1. Demonstrate knowledge on Energy auditing practices, conservation schemes and Energy economics and management.
2. Analyze Demonstrate skills in design for good lighting system and energy efficient motors.
3. Analyze various energy instruments, Payback analysis, depreciation, taxes and tax credit.
4. Familiarize demand side management practices

COs-POs-PSOs Mapping Table

Course Outcomes	Program Outcomes												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	-	-	-	-	2	2	2	2	2	-	2	2	-
2	2	-	2	-	-	2	2	2	-	-	-	2	2	-
3	2	2	-	-	-	2								