FACULTY OF ENGINEERING & TECHNOLOGY

First Year Master of Technology

Semester I

Course Code: 102450106

Course Title: ENERGY FORECASTING, MODELING AND PROJECT MANAGEMENT

Type of Course: Program Elective II

Course Objectives: To develop forecasting models and optimization models for energy planning. To equip the students in writing project proposals and making project cost estimation. To evaluate the limit cost of energy for various renewable energy systems.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	2	0	4	30 / 15	20 / 10	70 / 35	30 / 15	150 / 75

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	ENERGY SCENARIO: Role of energy in economic development and social transformation: Energy & GDP, GNP and its dynamics - Energy Sources and Overall Energy demand and Availability – Energy Consumption in various sectors and its changing pattern - Status of Nuclear and Renewable Energy: Present Status and future promise.	7
2	FORECASTING MODEL: Forecasting Techniques - Regression Analysis - Double Moving Average - Double Experimental Smoothing - Triple Exponential Smoothing – ARIMA model - Validation techniques – Qualitative forecasting – Delphi technique - Concept of Neural Net Works.	9
3	OPTIMIZATION MODEL: Principles of Optimization - Formulation of Objective Function - Constraints - Multi Objective Optimization – Mathematical Optimization Software – Development of Energy Optimization Model - Development of Scenarios – Sensitivity Analysis - Concept of Fuzzy Logic.	8

| 4 | PROJECT MANAGEMENT:
 Project Preparation – Feasibility Study – Detailed Project Report - Project Appraisal – Social-cost benefit Analysis - Project Cost Estimation – Project Risk Analysis - Project Financing – Financial Evaluation. | 7 |
| 5 | ENERGY POLICY:
 National & State Level Energy Issues - National & State Energy Policy - Energy Security – National solar mission - state solar energy policy - Framework of Central Electricity Authority (CEA), Central &States Electricity Regulatory Commissions (CERC & ERCs) | 8 |

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						R: Remembering; U: Understanding; A: Application, N: Analyze; E: Evaluate; C: Create
R	U	A	N	E	C	
15	15	20	20	20	10	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1	Forecasting Methods and applications S. Makridakis, Wiley.
2	Introduction to mathematical optimization: From linear programming to Metaheuristics, Yang X.S., Cambridge, Int. Science Publishing.
3	Centrifugal pumps and blowers, Austin H. Church, John Wiley and sons.
4	Organisational Behaviour, Fred Luthans, McGraw Hill, lnc, USA.
5	Principles of forecasting: a hand book for researchers and practitioners Armstrong, J.Scott Norwell, Masschusetts:Kluwer Academic Publishers
6	Energy Security in India Current Scenario. DhandapaniAlagiri, The ICFAI University Press.
7	Energy Security in Asia Current Scenario, Sukhvinder Kaur Multani, The ICFAI University Press.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	To know the energy demand of world, nation and available renewable resources to accomplish the demand	30 %
CO-2	Understand and able to the energy prediction using various forecasting techniques.	30 %
CO-3	Ability to develop optimization model for energy planning.	20 %
CO-4	Understanding of National and state energy policies.	20 %

List of Practicals / Tutorials:

1	Study of current energy scenario.
2	Study of fundamentals and taxonomy of forecasting.
3	To Study different statistical forecasting techniques.
4	Study of Neural Net Works.
5	Study of artificial intelligence techniques.
6	Development of energy optimization model.

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7	Study of mathematical optimization software .
8	To study concept of Fuzzy logic.
9	Study of different energy policy.
10	Case studies on load data for different markets and development of forecast models.
11	Case studies on wind speed/power data for different markets and development of forecast models.

Supplementary learning Material:

Curriculum Revision:	
Version:	**1**
Drafted on (Month-Year):	Apr-20
Last Reviewed on (Month-Year):	Jul-20
Next Review on (Month-Year):	Apr-22