

Course Title: Optimization of Renewable Energy Systems **(Elective Course)**

Course Code: RE-825

Objectives:

- To understand the importance of Renewable Energy Systems & learn optimization
- To learn about dispatch and Demand side management in the context of uncertainty of RE
- To understand the relation of Renewable Energy System and Electricity Markets
- To learn furcating of RE and its impact on power system
- To learn the planning and expansion of Transmission and distribution system
- To leant placing, planning and size of RE

Learning Outcomes

- Students will be able to understand optimization and its importance.
- Students will be able to define and quantify the key performance indicators of Renewable energy systems.
- Students will be able to apply the acquired knowledge to tackle the challenges of the energy transition

Course Contents

Introduction to Renewable Energy Systems; Types of RESs; Overview of renewable energy systems (RESs) The underlying issues related to the RES theme.

Introduction to Optimization; Basic principles of optimization; The mathematical formulation of the optimization problem; Categorization of the optimization problems; Increasing trend in the utilization of intelligent constrained optimization methods.

Dispatch and Demand side management in the context of uncertainty of RE; Optimal dispatch; RE participation in Optimal dispatch; Demand Side Management (DSM); RE participation in DSM

Renewable Energy System and Electricity Markets; Challenge faced by the renewable energy system in Electricity Markets; Bidding strategies for the renewable energy system.

Renewable Power Forecasting and Operation of Power System; Renewable power forecasts importance and benefits to the power system operation. Forecasting methods; Improving forecasting accuracy; Incorporating forecasts into decision-making process in power systems.

Optimum Transmission System Expansion Offshore Considering Renewable Energy Sources; Strategic importance of the transmission system; Renewable energy relation with transmission system; Introduction to GIS.

Optimum Sizing and Siting of Renewable-Energy-based DG Units in Distribution Systems; Introduction to Renewable distributed generators (DGs); Issues in DGs integration; Optimal siting and sizing of renewable DG units.

Optimum Design of Small-Scale Stand-Alone Hybrid Renewable Energy Systems; Introduction Island and standalone Grid; Optimization and Analyzation of isolated energy systems powered by solar PV / wind energies/ energy storage system.

Recommended Books

- Optimization in Renewable Energy Systems: Recent Perspectives 1st Edition, by Ozan Erdinc ; Butterworth-Heinemann.
- Design and Performance Optimization of Renewable Energy Systems 1st Edition; Publisher: Academic Press; 1st edition (January 12, 2021) by Mamdouh Assad , Marc A Rosen
- Power Generation, Operation, and Control 3rd Edition;by Allen J. Wood (Author), Bruce F. Wollenberg (Author), Gerald B. Sheblé (Author); Wiley-Interscience; 3rd edition