

Course Title: Modeling in Energy Systems (**Elective Course**)

Course Code: ESE- 809

Objectives: The primary objectives of this course are to familiarize students with practical applications of softwares used to model various aspects of energy systems ranging from energy planning strategies, carbon mitigation technologies, energy production & life cycle cost, evaluate supply & demand, depicting all possible flows to energy from resource extraction, through energy transformation and end-use devices, to demand for useful energy services.

Learning Outcomes:

The students will learn a multiple of software platforms leading to first order estimates to critical questions arising in the production and use of energy. This is considered universally as the preface to fabrication of experimental energy gadgets, which provides saving of time and costs

Contents:

Introduction to Modeling of energy systems; Energy Management in Buildings

Energy Audit; Software: Design Builder TRNSYS

Modeling of Energy usage in Buildings; Software: Design Builder TRNSYS

Modelling of geothermal systems for heating and cooling of buildings in domestic and commercial sectors.

Solar Energy ; PV (Application sided); Modeling of PV systems for off grid, on grid and isolated grid (Domestic, commercial and industrial scale) for different locations of Pakistan

Software: Polysun, TRNSYS, PV sol, Metonorm

Software: T*SOL and RETSCREEN, SAM-NREL

Software: HOMER

Solar Thermal systems modeling including solar cooling, heating

Software: Polysun, TRNSYS, T*SOL

Solar power generation system modeling for parabolic trough, concentrators, and solar chimney etc.

Software: ASAP PRO: optical analysis software and APEX and TRNSYS

Wind Energy

Modeling of wind energy systems for off grid/ on grid power generation systems;

Software: HOMER Energy systems, SAM-NREL

Energy Economics modeling; Software: RETScreen, Energy Costing Tool, LEAP, INVIVO and SPSS

Carbon Mitigation Technologies; Software: CO2DB

Recommended Books

- The Performance of Photovoltaic (PV) Systems: Modelling, Measurement and Assessment 1st Edition, by Nicola Pearsall (Editor) ; Woodhead Publishing
- Modeling and Optimization of Renewable Energy Systems by Arzu Sencan; IntechOpen