TECHNOLOGICAL EDUCATION INSTITUTE OF

CENTRAL MACEDONIA

SCHOOL OF TECHNOLOGICAL APPLICATIONS

DEPARTMENT OF MECHANICAL ENGINEERING

Graduate Studies Program: Academic Year 2015 - 2016	"Renewable Energy Systems: Design, Development and Optimization"

Supervisor's Name: Dr Dimitrios Sagris

Subject:

Combined renewable energy systems: optimum design by developed software support

Introduction & Motivation:

Renewable energy systems (RES) are established in recent years as a reliable solution of energy production, autonomous or cooperating on grid. The investment cost and risk in many cases is high. The proposed thesis investigates the design and performance optimization of combined RES, using as optimization criteria the cost and performance ratio or the depreciation time. The investigation includes extended record of locally available renewable energy sources (wind, solar, hydro, geothermal), as well as the cost of RES (photovoltaic, wind turbines, hydropower systems) and storage devices (batteries, hot water buffers). The goal of the thesis is to obtain a reliable multi-parametric model to decide the combination of RES to install in a specific area, taking into account economical restrictions. Furthermore, a user-friendly application will be developed in order to manage data of available energy sources and costs, conduct calculations of proposed system cost and performance, and simulate the daily, monthly and annual operation and financial result. Several examples will be tested to evaluate the proposed model.

Implementation & Means:

- Theoretical analysis of individual renewable energy systems
- Restrictions on combined renewable energy systems application
- Development of multi-parametric model on dedicated software

References:

[1] M.K. Deshmukh, S.S. Deshmukh, Modeling of hybrid renewable energy systems, Renewable and Sustainable Energy Reviews, Volume 12, Issue 1, pp. 235-249, 2008.
[2] Cecati C., Citro, C., Siano, P., Combined Operations of Renewable Energy Systems and Responsive Demand in a Smart Grid, IEEE Transactions on Sustainable Energy, Vol:2, Issue:4, pp. 468 – 476, 2011.

Requirements: Good knowledge of Renewable Energy Systems, Programming & Computational Mechanics