



TECHNOLOGICAL EDUCATION INSTITUTE OF
CENTRAL MACEDONIA
SCHOOL OF TECHNOLOGICAL APPLICATIONS
DEPARTMENT OF MECHANICAL ENGINEERING

Graduate Studies Program:
Academic Year 2014 - 15

**"Renewable Energy Systems: Design,
Development and Optimization"**

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Subject:

**Design of a Ground Source Heat Pump System to provide heating and cooling
energy in a building**

Introduction & Motivation:

The earth and groundwater below the surface provides a free renewable source of energy that can easily provide enough energy year-round to heat and cool a residential home. A Ground Source Heat Pump (GSHP) transforms this earth energy into useful energy to heat and cool buildings. GSHP provides low temperature heat by extracting it from the ground and also provides cooling by reversing this process. Additionally to its principal application of space heating and cooling, GSHP may also supply hot water for domestic use.

Implementation & Means:

A literature survey on the GSHP technology background and the recent applications will be performed. The RETScreen® International Clean Energy Project Analysis Software (www.retscreen.net) will be used for a case study of a GSHP typical installation in a building. The RETScreen® software and electronic textbook is available for university students. The GSHP system three major components: the heat pump, the earth connection and the interior heating / cooling distribution system will be examined and designed.

References:

- [1] Dickson, M. H. & Fanelli, M. *“Geothermal Energy: Utilization and Technology”*, McGraw-Hill, New York, 2001.
- [2] Banks, D. *“An Introduction to Thermo-geology: Ground Source Heating and Cooling”*, Prentice-Hall, Englewood Cliffs, N.J., 1993.
- [3] RETScreen® International *“Ground Source Heat Pump Project Analysis”* (www.retscreen.net) Canada, 2005.

Requirements: *Knowledge needed for a successful dissertation.*

Grade Pass and above for the course E3: Geothermal Energy Systems of this Graduate Studies Program.