

Master Thesis Brief Description

Thesis Title	Geothermal energy and how it can be applied for a sustainable climate building
Programme of Studies	MSc in Sustainable Energy Systems
Course	MES 580 MSc Thesis
Area of Study	Sustainable Energy Technologies – Geothermal Energy
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Supervisory Committee	Dr Chris Christodoulou, Professor, Mechanical Engineering Department Dr. George Karagiorgis, Professor, Mechanical Engineering Department
Semester	Fall Semester 2022
Short Description	<p>Geothermal (ground-source) heat pumps, known as GHPs, have experienced rapid global expansion as a renewable energy application, with an annual growth rate of approximately 10% over the past decade in about 30 countries. The primary advantage of GHPs lies in their utilization of typical ground or groundwater temperatures ranging from 5 to 30 degrees Celsius, available universally. These systems have been acknowledged for their high efficiency in distributing renewable heat, while their pivotal role in reducing carbon emissions gains increasing recognition. Research indicates that heat pumps, in general, have the potential to significantly reduce global CO₂ emissions by more than 6%, making them a crucial technology in the renewable energy landscape. This master thesis aims to compile comprehensive data on the essential features, operation, benefits, drawbacks, and other pertinent information related to GHP systems. Additionally, a detailed analysis of the GHP system will be conducted, measuring and analyzing various parameters to evaluate its performance when implemented in a building. A comparison will be made to typical heating or cooling systems used in structures, highlighting the differences and advantages of employing GHP technology. The study sheds light on the significance of geothermal heat pumps in sustainable energy distribution and emphasizes the potential for carbon emissions reduction in the global context.</p>