Geothermal Energy Systems

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Module number	Credits	Workload	Semester[s]	Duration	Group size
SE-CO-13	5 CP	150 h	1. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Geothermal Energy Systems	a) 4 WLH (60 h)	a) 90 h	a) each summer

Module coordinator and lecturer(s)

Prof. Dr. rer. nat. Rolf Bracke

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Admission requirements

Learning outcome, core skills

- After the course the students know how geothermal heat pumps can be used for heating and cooling. Students are able to dimension borehole heat exchangers (BHE) for small shallow geothermal systems (≤30 kW). They are also able to plan large systems which require a design by simulations. They can decide which design techniques and software is required for a specific site and project. The students know how a Thermal Response Test enhances the quality of the planning process and are able to interpret the measured data of the test.
- The students know the fundamentals of electricity generation from geothermal resources at low and at high enthalpy. They describe the function of the components of a power plant and understand the thermodynamics of fluid and steam cycles. They are able to design simple district heating networks and develop concepts for industrial applications for infrastructural and agricultural uses.

Contents

a)

- Global geothermal resources
- Elements of thermodynamics, fluid mechanics, and heat transfer applied to geothermal energy conversion systems
- Power plant technologies based on flash steam, direct steam, binary conversion systems, and hybrid systems
- Cooling technologies
- District heating networks and direct uses
- Pumping the reservoir
- Hybrid uses (water desalination)
- Mine water applications
- Corrosion and scaling processes
- Social and environmental impacts
- Case studies
- Economics, finance, and risk analysis of a geothermal project

Educational form / Language

a) Tutorial (1 WLH) / Lecture (3 WLH) / English

Examination methods

• Written exam 'Geothermal Energy Systems' (60 min., Part of modul grade 100 %, Optional homework (40 h), max. 10 pages, 4 weeks time for completion, submission deadline is announced at the beginning of the semester, bonus points in the examination in case of successful completion), exercise tasks)
Requirements for the award of credit points pass the examination
Module applicability • M.Sc. Subsurface Engineering • M.Sc. Geoscience
Weight of the mark for the final score Percentage of total grade [%] = 5 * 100 * FAK / DIV FAK: The weighting factors can be taken from the table of contents. DIV: The values can be taken from the table of contents.
Further Information