Geothermal Energy
- Introduction of the course(Week1, 2 Sept)

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Introduction
Today's Content

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- This lecture will be given in English. Why???

- Today, we will cover
  - Introduction to the course

Introduction
Schedules, Room and Instructors

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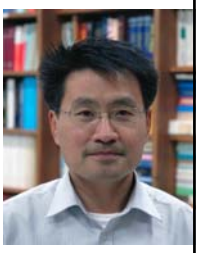
- Lectures (3 credits)
  - Mon & Wed: 9:00 – 10:15
- Lecture Room: 39-323
- Instructor and Teaching Assistant
  - Ki-Bok Min, Room:38-108, kbmin@snu.ac.kr
  - Jae Won Lee, Room:38-125, sodg3135@snu.ac.kr



Introduction
Objectives of the course

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- Objective;
  - Provide an introduction to geothermal energy
  - Understand the basic principles needed for geothermal energy utilization such as heat transfer, fluid flow in rock and borehole stability
  - Understand the technique for direct/indirect(power generation) use of geothermal energy
  - Identify major issues associated with further development for geothermal energy
  - Develop skills to effectively synthesize information and communicate with other people – written, oral and listening skills

Introduction
Contents of the course

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- Week 1: Introduction to the course
- Week 2: Overview of Geothermal Energy
- Week 3: Heat Transfer (1) – conduction, convection, radiation
- Week 4: Heat Transfer (2) – Heat diffusion equation
- Week 5: Fluid flow in porous media
- Week 6: Fluid flow in fractured media
  Exploration techniques (invited lecture)
- Week 7: Mid-term exam
  Reservoir Geomechanics (borehole stability, drilling engineering, hydraulic fracturing)

Introduction
Contents of the course

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- Week 8: Reservoir Geomechanics
- Week 9: Environmental Impactof Geothermal Energy Utilization
  Geothermal Power Generation
- Week 10: Geothermal Power Generation
  Enhanced Geothermal System (EGS)
- Week 11: Video & Final Exam
- Week 12: Report Writing Guide & Field Visit
- Week 13: Geothermal Energy in Korea (invited lecture)
  Heat Pump applications in Korea (invited lecture)
- Week 14: Case Study
- Week 15: Student conference

Field Visit

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- Will be arranged to a drilling site for a district heating.
- Friday?
- To be fixed later.

Introduction
Textbooks

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- Textbooks
  - DiPippo R, 2008, Geothermal Power Plants: Principles, Applications, Case Studies and Environmental Impact, Elsevier, 2nd Ed.
  - Gupta H, Roy H, 2007, Geothermal Energy - An alternative resource for the 21st century, Elsevier
  - MIT, 2006, The future of geothermal energy - Impact of Enhanced Geothermal Systems (EGS) on the United States in the 21st century, US Department of Energy, http://www1.eere.energy.gov/geothermal/future_geothermal.html
  - Tester JW et al., 2005, Sustainable Energy - Choosing among options, The MIT Press, (chapter 11)
  - Zoback MD, 2007, Reservoir Geomechanics, Cambridge University Press
  - Scanned copy and handouts will be distributed as needed

Useful materials

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- US Department of Energy: http://www1.eere.energy.gov/geothermal/index.html
- Geothermal Education Office: http://geothermal.marin.org/
- Geo Heat Center: http://geoheat.oit.edu/
- International Geothermal Association: http://iga.igg.cnr.it
- Google's initiative on EGS: www.google.org/egs

- 한국에너지관리공단: http://www.kemco.or.kr/
- 한국신.재생에너지학회: http://www.ksnre.or.kr/
- 한국지열에너지학회 (주로 히트펌프): http://www.ksgee.or.kr

Introduction
Assessment

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- Assessment
  - Homework : 30 %, ~1 homeworks /2 weeks,
  - Mid/Final exam : 30 %
  - Term project : 30 %
  - Participation : 10 % (attendance + eTL discussion & FAQ + α)

Introduction
Term Project

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- An enjoyable learning experience - become familiar with the technical, economic, political, and environmental issues associated with the topic that they are exploring.
  - Both report and presentation should be in English
  - Make a group of 3
  - Select (or suggest) a topic of your own interest
  - Timeline
    - 25 Sept Submission of proposal (~1 page)
    - 30 Oct Submission of progress report (~5 pages)
    - 4 Dec Submission of final report (~20 pages)
    - 7 Dec, 9 Dec Presentation of term project

Introduction
Term Project

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- A list of example topics
  - Installation of Geothermal Heat Pump in Korea
  - Global warming/climate change/Co2 emission and geothermal Energy
  - Combination of carbon geosequestration and geothermal energy
  - Is enhanced geothermal system applicable in Korea?
  - Case study (The Geysers in the US, Soultz site in France, Iceland, Sweden, etc)
  - Case study in Cooper Basin in South Australia
  - History of Geothermal Energy utilization – an effort by Los Alamos Laboratory
  - Numerical simulation of EGS
  - The role of Reservoir Geomechanics for Geothermal Energy
  - Issues in drilling engineering
  - Geothermal energy – why I never heard of it

Introduction
Term Project

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- Presentation
  - Presentation is an extremely important part of your professional life. Therefore, you have a good reason to be serious about this.
  - 15 minutes + 5 min (questions)
  - Be dressed professionally (e.g., tie/suit)
  - Split the time of presentation between your members
  - Presentation files should be submitted via eTL.
  - The group for asking questions will be designated before hand.

Introduction
Teaching Style

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- My objective is for you to learn and enjoy this course.
- I encourage class participation and questions at any time.
- Please don't be shy to ask questions - I never ridicule.
- I will try to reply to your email within 1 working day – you are welcome to send email.
- Especially, you are very welcome to visit my office to discuss the concept you want to understand. I am always available for a chat.

Introduction
What I expect from you

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- Attend classes & Be attentive
- Keep up with the lecture material (read the related material and try to ask fundamental questions).
- Ask questions (to your peers or me) if you do not understand what is being taught.
- Do not plagiarise. Cheating is not tolerated and cheats will be punished.

www.simcheong.com

Introduction
eTL

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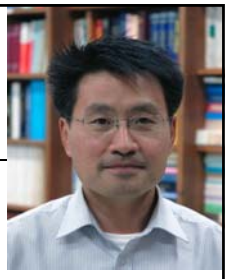
- All the teaching materials will be available at eTL
- Please register your picture, mobile phone number and email address at eTL
- You are encouraged to engage in Q&A and useful materials (자료실) – bonus point

Introduction
A little about me



- '89 - '94 :BSc (Mineral and Petrolem Eng, SNU)
- '94 - '00 :MSc (Rock Mechanics, SNU)
- '94 – '97: Tunnel Engineer, Dongbu Const & Eng
- '99 – '00: Researcher, Korea Institute of Construction Tech (KICT)
- '00 – '04: PhD (Engineering Geology), Royal Inst of Tech (KTH, Sweden)
- '04 -'05: Researcher, KTH
- '04 -'05: Consultant, Itasca Consulting Group, Sweden
- '06 – '07: Postdoc, Penn State, USA
- '08 -'09 : Lecturer (Assistant Prof), Uni of Adelaide, Australia

Introduction
Questions

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- Any questions about anything I've said thus far?