## SPE 2423 GEOTHERMAL ENERGY TECHNOLOGY – 45 HOURS

**Prerequisite** SPE 2322 Geophysics, SPE 2413 Geothermal Energy Systems

**Purpose**

To equip the student with understanding of the technological principles for different types of geothermal power plants

**Learning Outcomes:**

At the end of this course, the student should be able to:

1. Describe the design requirements for different Geothermal energy systems.
2. Explain the thermodynamics involved in geothermal energy production conversion processes.
3. State the equipment lists for the implementation of the geothermal power plants.
4. Describe hybrid geothermal power plants.
5. Discuss the environmental impact of geothermal power plants.

**Course Description**

Single-flash steam power plants: system design considerations, energy conversion system, thermodynamics of the conversion process, single flash optimization, environmental aspects for single flash plants, equipment list for single flash plants. Double-flash steam power plants: design considerations, energy conversion system, thermodynamics of the conversion process, double flash optimization, scale potential in waste brine, environmental aspects for double flash plants, equipment for double flash plants; Dry-steam power plants: origin and nature of dry-steam resources, steam gathering system, energy conversion system, optimum wellhead pressure, environmental aspects of dry-steam plants, equipment for dry-steam plants; Binary cycle power plants: basic binary systems, working fluid selection, advanced binary cycles, environmental impact of binary cycles, equipment list for basic binary plants; Advanced geothermal energy conversion systems: hybrid single flash and double flash systems, hybrid flash-binary systems, hybrid geothermal systems, solar-geothermal hybrid plants.

**Teaching Methodology**

Lectures, laboratory practicals, class discussions, tutorials, and field excursions if necessary

**Instructional Materials/Equipment**

White board and white board markers, LCD projector, Laptop and Internet connection, Laboratory Equipments and Components

**Course Assessment**

Continuous Assessment 30%

End of Semester Examination 70%

**Core Reading Materials:**

**Course Textbooks**

1. DiPippo R. (2005). *Geothermal Power Plants: Principles, Applications, Case Studies,* (1st Ed.). Elsevier Science, ISBN-13: 978-1856174749
2. Stober I., Bucher K. (2013). *Geothermal Energy: From Theoretical Models to Exploration and Development,* (2013th Ed.). Springer, ISBN-13: 978-3642133510
3. Glassley W.E. (2014). *Geothermal Energy: Renewable Energy and the Environment,* (2nd Ed.). CRC Press, ISBN-13: 978-1482221749

**Course Journals**

1. *Journal of Technology Innovations in Renewable Energy, Life Science Global, ISSN: 1929-6002*
2. *Journal of energy Resources Technology, ASME, ISSN: 0195-0738*
3. *International Journal of Renewable Energy Research, JFRER, ISSN: 1309-0127*

**Reference Materials:**

**Reference Textbooks**

1. Dickson M.H., and Fanelli M. (2005). *Geothermal Energy: Utilization and Technology* Routledge, ISBN-13: 978-1844071845
2. Watson A. (2013). *Geothermal Engineering: Fundamentals and Applications,* (2014th Ed.). Springer, ISBN-13: 978-1461485681
3. Grant M.A., and Bixley P.F. (2011). *Geothermal Reservoir Engineering,* (2nd Ed.). Academic Press, ISBN-13: 978-0123838803
4. Huenges E., and Ledru P. (2010). *Geothermal Energy Systems: Exploration, Development, and Utilization,* (1st Ed.). Wiley-VCH, ISBN-13: 978-3527408313

**Reference Journals**

1. *An International Journal of Energy Conversion and Management, ELSEVIER, ISSN: 0196-8904*
2. *International Journal on Energy Conversion, PWP, ISSN: 2281-5295*
3. *International Journal of Geothermal Research and its Applications, ELSEVIER, ISSN: 0375-6505*