## Course Structure

**Course Code :** **SM7206**

**Course Title :** **Thermal Energy systems**

**Credit Hours :** **3**

### Course Description

Introductory material, engineering economics, conservation and balance laws, fluid flow fundamentals, pipe networks, pumps, cavitation, heat exchanger, condensers, evaporator, boilers, thermal energy system simulation.

### Course Objectives

- Explain and describe the technical functionality and principles of different thermal energy systems.
- Describe the environmental impact of different energy conversion processes.
- Explain and compare different thermal energy systems.
- Explain and describe useable resources for thermal energy systems.
- Carry out thermodynamic calculation in EES or MATLAB.

### Course Topics

- Introductory material
- Engineering economics
- Application of conservation and balance laws
- Review of fluid flow fundamentals
- Minor losses.
- Series and parallel pipe networks
- Economic pipe diameter
- Pump performance and selection
- Cavitation
- Series and parallel pipe systems
- The affinity law for pumps
- Heat exchanger, LMTD, and e-NTU methods
- Double-pipe heat exchanger
- Shell and tube heat exchanger
- Regenerative HX, condensers, evaporator, boilers
- Plate and frame heat exchanger
- Cross-flow heat exchanger
- Thermal energy system simulation
- Fitting component performance data
- Optimization using Lagrange multiplier
- Optimization using software

### References

- Thermal Energy Systems: Design and analysis, [Steven G. Penoncello] 2015 by CRC press, ISBN 9781482245998