



T-863-EIIP

ENERGY IN INDUSTRIAL PROCESSES

8 ECTS

Year of study:	3 rd year (final year BSc) /4 th or 5 th year (first or second year MSc).
Semester:	Fall.
Level of course:	3. First cycle, advanced / 4. Second cycle, introductory.
Type of course:	Elective. <i>Recommended elective for MSc Electrical Power Engineering, MSc Energy Engineering, and MSc Mechanical Engineering.</i>
Prerequisites:	N/A
Schedule:	Runs for 12 weeks – 6 teaching hours a week.
Supervisor:	Guðrún Arnbjörg Sævarsdóttir.
Lecturer:	Guðrún Arnbjörg Sævarsdóttir.

Learning outcome:

On the completion of the course, the following criteria shall be fulfilled:

Knowledge: Upon completion of the course, students should have good understanding of:

- how electricity can be turned into products
- how Enthalpy and Gibbs energy shape energy intensive production processes
- the use of mass- and energy balance for process analysis
- how production processes, raw materials, energy sources, energy demand and finished products affect the environment and how such effects can be minimized
- the fundamentals of silicon and aluminium smelting and refining

Skills: On completion of the course, the student should be able to:

- apply mass and energy balance to explain the main principles in energy intensive processes
- calculate the energy and gas flow in a combustion process
- calculate the energy needed for aluminium and silicon smelting
- set up feasibility models for simple projects

Competence: On completion of the course, the student should be able to utilize the knowledge and skills to:

- promote and stimulate innovation in energy utilization
- set up process models to verify feasibility and environmental effects of processes

Content: The course covers the use of energy in industrial processes and society. The principles of mass and energy balance are applied to processes taking into account thermodynamics and thermochemistry. The chemistry of metallurgical processes such as iron and steel production is covered but the focus is on the industrial processes that are prevalent in Iceland, aluminum and silicon. In addition, other energy intensive processes such as cement production, mineral wool, fertilizer, and synthetic fuel are discussed.

The main emphasis is on the student's ability to get an overview over various processes in terms of material and energy flow, raw materials, energy use and efficiency, environmental effects, and mitigation. In addition, the economic background i.e. the cost, profit and market conditions are addressed.

Field trips are an integral part of the course.

Reading material: To be announced.

Teaching and learning activities: Lectures, field trips, and discussions. Guest lectures from industry.

Assessment methods: Two mandatory field trips. Assignments (10%), individual projects (20%), group project (40%) and oral exam (30%).

Language of instruction: English.

All course descriptions may be subject to change. Revised information on the course schedule, reading material, teaching and learning activities, and assessment methods will be introduced in the learning management system Canvas at the beginning of the semester.