



**SE-834-HPM**

**HYDRO POWER MANAGEMENT**

**6 ECTS**

- Year of study:** First year MSc.  
**Semester:** Spring.  
**Level of course:** 4.-5. Second cycle, introductory-intermediate.  
**Type of course:** ***Taught in the Iceland School of Energy.*** Elective for all MSc programs in engineering.  
**Prerequisites:** No prerequisites.  
**Schedule:** Taught during the 12-week teaching period. Schedule will be introduced in the learning management system Canvas at the beginning of the semester.  
**Supervisor:** Juliet Newson.  
**Lecturer:** Ásbjörg Kristinsdóttir, Andri Gunnarsson.

**Learning outcome:**

*Knowledge:*

- Overall structure of hydropower plants
- Energy potential of a river/catchment, influence of flow variations
- Understanding of the design of waterways, reservoirs and dam types, outlet works, spillways, floods and turbine types
- Understanding of environmental and social challenges
- Influence of climate change on hydropower / water resources
- Reservoir sedimentation, sedimentation challenges, and outlook
- Synthesis paper of hydropower potential in a country of own choice
- Environmental impact assessment for a given hydropower plant profile

*Skills:*

- Industry stakeholder analysis, through different stages of project development
- Assessing and monitoring hydropower project risk and uncertainty

*Competence:*

- Adapt to changing environment and apply analytical competence to hydro power developments
- Apply analytical skills and methodologies to recognize, analyze, synthesize and implement solutions to hydroelectric related problems.
- Apply standard engineering and scientific principles to develop analytical solutions to a range of hydroelectric problems

**Content:**

This module will present an overview of hydropower, the components of hydropower plants and preliminary design of hydropower projects. The first half of the course will focus on fundamentals in hydropower design and discuss the main modules that a hydropower plant consists of. Students will learn to assess energy potential for hydropower projects, optimization of dams and dam types, spillway and outlet designs, and energy dissipation. Different turbine types and their application and design will be discussed.

In the second half of the course the focus will shift to development challenges and economics, both for individual projects, and for the industry as a whole. Students will work towards a final project where the goal is to make a preliminary design for a real hydro power project in combination with other assignments.

The course will emphasize applied learning, with hands-on exercises and a final project. Introductory lectures will provide background information, with readings outside of class to supplement and selection of homework with simple calculations. Students will select a final project to work towards the end of the semester with a final presentation and summary report.

**All course descriptions may be subject to change.** Revised information will be introduced in the learning management system Canvas before the beginning of the semester.



**Reading material:**

Slides and other preparation material will be distributed through Canvas. The following reading material is required reading for the second half of the course:

- International Hydropower Association, *Hydropower status report 2018* (2018) [available online (Links to an external site.)Links to an external site.]
- World Energy Council, *World Energy Resources, Hydropower, 2016* (2017) [available online (Links to an external site.)Links to an external site.]

International Hydropower Association, *Hydropower Sustainability Guidelines* (2018) [available online (Links to an external site.)Links to an external site.]

**Teaching and learning activities:** Will be introduced in the learning management system Canvas at the beginning of the semester.

**Assessment methods:** Students will be evaluated based on demonstrated understanding of material through class discussions, assignments and final project report/presentation. Further defined in Learning Management System.

**Language of instruction:** English.