**MEC7108: Hydropower Systems**

| Hours per Semester | | | | Weighted Total Mark | Weighted Exam Mark | Weighted Continuous Assessment Mark | Credit Units |
|---|---|---|---|---|---|---|---|
| LH | PH | TH | CH | WTM | WEM | WCM | CU |
| 35 | 10 | 10 | 45 | 100 | 60 | 40 | 3 |

**Course Description**

The course covers concepts of hydropower systems including pico, mini, small and large scale plants. It gives a general overview on types of hydropower plants, planning, assessment of hydropower resources, dam design, mechanical and electrical equipment, economic analysis of hydropower plant and the environmental impacts.

**Course Objectives**

The objectives of this course are to:

- Enable the students appreciate the components of a hydropower systems
- Enable the students understand the procedures for design of hydropower plants and how to carry out hydropower resource assessment.
- Introduce the students to the economic analyses of hydropower projects
- Introduce the students to the aspects of hydropower environmental aspects and how they can be abated

**Learning Outcomes**

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

- Describe the theory of operation of hydro energy sources and how they produce energy.
- Explain how the various tools and procedures are used in the design and analysis of power plants
- Compute key characteristics of a small hydropower scheme given basic data
- Explain the effects of hydro energy on the current world energy situation.
- Communicate effectively with both lay and technical audiences about the challenges and opportunities of a Hydro-based economy.

**Detailed course Content**

Introduction to Hydropower **(3 Hours)**

- Potential and developed hydropower resources
- World hydropower usage
- Hydropower resource in Uganda
- Categorization of hydropower plants

Hydropower Planning **(9 Hours)**

- Hydrologic cycle
- Data acquisition
- Rainfall and discharge measurements

- Flow duration curves, Power duration curves, firm power
- Annual Energy production

Hydropower components **(8 Hours)**

- Dams; construction and types
- Mechanical components design and selection
- Electrical components
- Civil works

Economics of Hydropower plants **(6 Hours)**

- Power markets, regional power pools
- Economic and Financial analysis
- Production and operating strategy

Impacts of Hydro power plants **(3 Hours)**

- Environmental aspects
- Ecological and Social impacts

Software and preliminary design **(6 Hours)**

- Introduction to relevant software for hydropower design

Practical: Turbine – pump efficiency determination, Impulse of a jet on surfaces, Surge tank transients **(10 Hours)**

**Mode of delivery**

This course will be delivered through lectures, tutorials, exercises, field visits and group projects aimed at solving real life problems.

**Method of Assessment**

Students will be assessed through assignments, tests, practical work and projects which make up the course work and a final exam at the end of the course as follows:

| | |
|---|---|
| Course work | 40% |
| Final Exam | 60% |
| Total Mark | 100% |

**Reference Textbooks**

[1] Annund Killingtveit, Nils R. Saalthum (1998*). Hydrology for Hydropower Development* Series No. 7, NTNU Hydraulic Engineering division.

[2] Peter L. Payne, (1988) *The Hydro*, Aberdeen University Press (ISBN 0-08-036584-1)

[3] Gulliver J.S., and Arndt R.E.A. (1991) *Hydropower Engineering Handbook*, McGraw Hill Inc. 1991 ISBN. 0-07-025193-2

[4] Linsley R.K et al. (1998). *Hydrology for Engineers*, McGraw Hill Co.