

## Hydraulic Engineering and River Management

**Hydraulic Structures** is covered in two semesters. In the first semester main structural components of hydraulic engineering schemes such as weirs, dams, hydro power plants and pipelines are explained. The application of structural power plants, reservoirs and river development works is discussed. Conventional engineering methods as well as approaches with improved environmental compatibility are taken into consideration. In the second semester an extensive case study is undertaken on planning and dimensioning of a real hydraulic structure. There are hydraulic calculations to be carried out such as hydraulic capacity of spillway, dimensioning of stilling basin, hydrological and sedimentological calculations.

**Measurements in the Watercycle** contains two modules: *Measuring Surface Hydrological Fluxes* and *Measuring Subsurface Hydrological Fluxes*. For *Measuring Surface Hydrological Fluxes* methods to measure surface water discharge and precipitation are investigated. In *Measuring Subsurface Hydrological Fluxes* different methods to measure soil water content are studied. Methods like Ground Penetrating Radar (GPR), Electrical Resistivity Tomography (ERT), Electromagnetic Induction (EMI), Magnetics and Seismic are investigated in detail which also includes a field case study.

**Integrated River Management and Engineering** is divided into two parts: *River Engineering* and *Sediment Management*. The module deals with the origin of sediments, fundamental principles of sediment transport and sediment management measures on different scales, as well with the river basin management and results of basic inventory due to the Water Framework Directive (WFD). *Integrated Flood Protection Measures* encompassed socio-economic aspects of flood damage, calculation of floodwater depths, technical flood protection measures and design and operation of retention basins among other things.

**Water Resources and Irrigation - Planning Methods and Tools** is subdivided into three parts. In *Water Management and Irrigation Facilities*, issues of water demand, scarcity and availability for irrigation are accessed. Irrigation methods, equipment, design considerations and impacts are looked upon. *Multi Objective Decision Making in Water Resources Management* the use of evaluation and decision-making methods in order to determine long term effects on planed actions is addressed. Registration, quantification and evaluation of project alternatives using different methods and techniques are studied. For *Computer Applications in Water Engineering*, theory and application of computer programs such as SimResSedim (for water and sediment balance of reservoirs), Cropwat (for crop water requirements and irrigation scheduling) among others are studied.

**Structural Engineering of Hydraulic Structures** consists of two parts as well. *Structural Design, Restoration and Monitoring of Dams* deals with the determination of internal forces of tanks, silos, arched dams using membrane and bending theory. Also, an introduction to Finite Element Methods (FEM) for structural hydraulic engineering is given. The part *Hydraulic Gates* tackles mechanics, operation, maintenance as well as design of different type of hydraulic gates.