HBB340 - Water Levels and Flow

Mis à jour le 02-04-2021

Code : HBB340

Unité d'enseignement de type mixte

3 crédits

Volume horaire de référence (+/- 10%) : **30 heures**

Responsabilité nationale : EPN08 - Institut national des sciences et techniques de la mer (INTECHMER) / Claire MARION

Présentation

Objectifs pédagogiques

Module Outline:

Description of the forces generating tides (static and dynamic theory).

Description of the major harmonic constituents. Identification and recognition of the different types of tides.

Explanation of the concept of amphidromic points and cotidal charts.

Definition of the different tidal levels.

Explanation of the working principles of different types of water level gauges and poles. Describe the characteristics of river, coastal and offshore water level gauges. Description of the installation and operation of water level gauges and poles

Description of the relation between flow and tides. Definition of rectilinear and rotary tidal streams and related elements. Field measurements for tidal flow and currents, including log ship, pole and current meters.

Prediction of water levels for main and secondary ports, using tide tables. Calculate water level at a particular time, and/or calculate the time at which a specific height will occur.

Application of cotidal chart information.

Compute tidal predictions using numerical models.

Description of the temporal and spatial effects on water level caused by: atmospheric pressure, wind, seiches, and precipitation. Identification of water level variations occurring in rivers and lakes and due to dam operations.

Publications & Case studies

Compétences

Learning Outcomes:

Fundamental knowledge of tides, tide prediction and use of in the information obtained.

Knowledge about tidal fundamentals and their origin, the use of data and information.

Programme

Contenu

Lecture 1 – General introduction and principal water level variation

General introduction wave theory

Water level variations (waves, storm surges, fresh water discharge, seiches, tsunamis, tides)

Case safety against flooding (s-plan, d-plan)

Tide generating forces

Temporal variations of tides

Classification of tides

Lecture 2 – Estuaries

Connection between rivers and oceans/seas

Introduction in sediment transport

Introduction in river morphology

Processes determining tidal propagation in estuaries

Currents, salt intrusion and sediments in estuaries

Case Schelde estuary

Lecture 3 – Hydrometric measurements

Different techniques to measure water levels

Datum control, benchmarks and levelling

Data transmission and validation

Different techniques to measure flow velocities

Measurement techniques for salinity, sediment transport

Examples for the Schelde estuary

Lecture 4 - ATT

Introduction of Admiralty Tide Tables

Practical 1 - ATT

Exercises on application of ATT

Lecture 5 – Harmonic analysis

Introduction on harmonic analysis of tides

Prediction of water levels using harmonic analysis

Practical 2 – Harmonic analysis

Exercise deriving harmonic components using versatile tidana

Exercise predicting water levels using derived harmonic components in versatile tidana

Practical 3 – Field visit

Field visit of tide gauge

Field visit hydrometric instruments at Flanders hydraulics

Lecture 6 – Cotidal lines and models

Cotidal lines

Introduction on numerical models

Case Water level predictions in the Schelde estuary

Modalités de validation

- Contrôle continu
- Examen final