HBB350 - Geodesy & Cartographic Systems

Mis à jour le 02-04-2021

Code : HBB350

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

Prérequis

Entry requirements

Initial Competences

Same as to be admitted to higher education.

Good knowledge of mathematics

Good knowledge of physics

Good knowledge of English

Relation to other courses

HB300 – Information technology

HB310 – Navigation

HB340 – Tides and currents

HB360 – Hydrographic surveying

HB370 – data management

HB500 – Hydrographic practice

Objectifs pédagogiques

Module Outline:

1. Introduction to geodesy

- The shape of the Earth

- The ellipsoid of revolution and its relation to the Geoid

- Datums

- The principles of gravity models and gravity reduction

- Transformation between ellipsoids and/or datums

- Celestial sphere and coordinate systems

- Basics of astronomic positioning

- Impact of geocentric vs. Local geodetic datums

- Essentials of gravimetry

- Vertical reference systems

- Definition of a cartographic system

2. Coordinate systems for positioning

- Time: Julian date, civil time, official time, astronomic-, sidereal- and solar time GPS time

- Geodetic, astronomic, orbital and geocentric systems

- The Conventional Terrestrial System and some of its practical realizations such as GRS80, WGS84 etc.

3. Geodetic computations

- Plane and geodetic computations. Calculate forward and inverse computations on the ellipsoid using appropriate software

4. Map projections

General theory on map projections

Classification (orthogonal vs. Non-orthogonal, etc...)

Main properties of cylindrical, azimutal and conical projections (including development of the analytical projection formulae)

Deformations (conform, equivalent, equidistant, aphylactic)

Calculation of the deformation based on the indicatrix of Tissot

Detailed approach of certain conformal projections (Mercator, Stereographic Azimutal)

UTM (including military and civil grid system)

5. Grids and graticules on projections

6. Map Use

Reading and understanding of the metadata on maps and use of them regarding the map reading.

Transformation between geographic and grid coordinates, compute convergence, scale factors and arc to chord corrections, using appropriate software

Compétences

Learning Outcomes:

1. Describe the shape of the Earth in terms of potential and ellipsoidal models
2. To be able to explain modern geodetic reference systems and associated reference systems
3. Explain horizontal and vertical datum transformation concepts
4. Being able to describe geometry of lines on the ellipsoid and perform forward and inverse computations on the ellipsoidal surface
5. Explain the properties and distortions in different types of projections used in maps and charts
6. To be able to explain projection types and to apply appropriate projection formulae
7. To be able to distinguish gravity-related and ellipsoidal heights

Programme

Contenu

Lecture 1 Introduction to geodesy

Lecture 2 Coordinate systems for positioning

Lecture 3 Geodetic computations

Lecture 4 Map Projections

Lecture 5 Grids and graticules on projections

Lecture 6 Map Use

Modalités de validation

- Contrôle continu
- Examen final

Description des modalités de validation

Evaluation

Evaluation form

Written examination, partly with multiple choice, partly with open questions.

Fieldwork – permanent evaluation the practical exercises.

Assessment methodology

The final figure of assessment is composed of:

80% (written examination)

20% (permanent evaluation)

Assessment criteria

Theory examination: quality of knowledge, insight, relation between subjects, …

Permanent evaluation: workshops, proof of attendance, portfolio: reports, exercises, ...