lbirf2101

2021

Mesure des arbres et des peuplements forestiers

4.00 credits	30.0 h + 22.5 h	Q2

Teacher(s)	Jonard Mathieu ;Ponette Quentin (coordinator) ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	Supplementory courses: The course focuses on ground-based assessment methods. Air-borne methods for natural resource assessment are developed in the courses of geomatics, surveying and photogrammetry.
Main themes	1. Main concepts: - Definitions, interest, measurement and / or estimation of static characteristics of trees (e.g. diameters, heights, volumes, tree form) and stands (e.g. distributions, density and stocking, productivity and site quality); - Growth of trees and stands: concepts, estimation, production tables, modeling principles; - Complete inventory and sampling methods: (i) basic concepts of sampling, (ii) sampling units, (iii) programming, implementation and processing of inventory results, (iv) inventory methods (e.g. systematic inventory, simple random sampling, point sampling, stratified random sampling, single-stage cluster sampling, double sampling).
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 a. <u>Contribution de l'activité au référentiel AA (AA du programme)</u> M1.1, M1.2, M1.4, M2.1, M2.2, M2.4, M3.5, M3.6, M3.7, M3.8, M6.2, M6.5, M6.8, b. <u>Formulation spécifique pour cette activité des AA du programme</u> At the end of this course, the student: - knows the principles of operation of the main dendrometric instruments and is able to use them appropriately in the field; - knows how to characterize the trees and stands in terms of stocking and growth; - is able to understand the dynamics of forest stands and to formalize the factors involved in a quantitative way; - knows the main 'tools' used to characterize the growing stock (individual tree, stand) ; is able to use existing tools appropriately, and to build them from raw data; - knows and understands the main methods used to estimate the growth of trees and stands ; is capable to use them in a management context; - knows the principles of sampling and is able to establish appropriate sampling strategies to address a management issue related to forestry, forest management and planning; - is able to formalize and synthesize a forest mensuration analysis in a technical report respecting scientific rigor;
Evaluation methods	- Written closed-book examination (49%); - Evaluation of the mini-project report (35%); - Evaluation of an exercise dedicated to the construction of a yield table: individual report (8%) and oral examination (8%).
Teaching methods	- Lectures, including concrete examples, case studies and exercises - Realization of a mini-project involving the acquisition of field measurements, a computer-aided processing and the writing of an argued report. This report is illustrated with graphs and tables.
Content	a. Table of contents **Part I – Tree-level characerics** - volumes and biomasses : wood density, stem form assessment; stem form and volume ; log rules; volume tables - individual tree size and height **Part II – Stand-level characteristics** - mean tree characteristics: size, heights, volumes - cumulative variables: basal area, volumes - distributions - relationships between dendrometric characteristics: dominant height - age - site fertility; total height - size - age **Part III - Growth of trees and stands** - tree growth: size (circumference, radius, diameter, basal area); height and volume increment; stem analysis

- stand growth: repeated stand inventories; increment core method; applications

Part IV - Inventories

- fundamentals of sampling: context; variables, scales, units; populations and samples; sampling; types of estimators and tree/plot factors

- sampling units : types of sampling units; comparison between sampling units; sampling units over time and space

- sampling methods: simple random sampling; systematic sampling; point sampling; stratified random sampling; single- and multi-stage sampling; double sampling

Partie V – Forest modeling

- introduction to forest modeling: why do we need models, definition and features of a model, modeling steps and methodology, modeling approaches: empirical *vs* process-based

- empirical growth and yield models: model classification based on the spatial scale (stand, cohort and tree level, distance dependent *vs* independent), mathematical formalization of silvicultural concepts, development of a yield table, application to a case study (Patula pine plantation in the Peruvian Andes)

b.   Additional information

This course consists of two modules:

- Module 1 (30h): Theoretical course - 14 sessions of 2 hours on the methods of measurement and sampling as well as on the main tools used for the quantification of trees and forest stands, including modeling.

- Module 2 (22.5 h): The principles studied in theoretical courses are implemented in the form of a mini-project involving the acquisition of field measurements and their computer-aided processing.

Inline resources	Moodle
Bibliography	Les supports de cours obligatoires (diapositives power point, documents de référence) sont mis à disposition de l'étudiant sur Moodle Pour en savoir plus, l'étudiant pourra consulter utilement les ouvrages de référence suivants : - Rondeux, J. 1999. La mesure des arbres et des peuplements forestiers. Les Presses Agronomiques de Gembloux, Gembloux, Belgique, 521 p. - Shiver, B.D., Borders, B.E. 1996. Sampling techniques for forest resource inventory. John Wiley & Sons, New York, USA, 356 p.
Other infos	This course can be given in English.
Faculty or entity in charge	AGRO

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Forests and Natural Areas Engineering	BIRF2M	4		🔍