UCLouvain

lbirf2104

2022

Ecologie et santé des forêts

4.00 credits	45.0 h	Q2

Teacher(s)	Bragard Claude ;Legrève Anne ;Ponette Quentin ;Vincke Caroline (coordinator) ;
Language :	French > English-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	Sylviculture, general ecology, plant physiology, botany, soil sciences, phytopathology bases.
Main themes	This course aims to provide the foundations necessary to understand how biotic and abiotic factors, in interaction, affect the functioning and health of forest ecosystems. The regulation of energy, water, nutrient and carbon flows within the soil-tree-atmosphere continuum is described, as well as extreme abiotic (heat waves, pollution, drought, etc.) or biotic (pathogens and pests) likely to disturb trees. Biotic factors are presented according to their cycles / modes of development and their symptoms. This course also provides the bases necessary to carry out the diagnostics highlighting the imbalances in the functioning of forest ecosystems. Finally, it proposes management strategies to reduce the exposure of ecosystems to risks, increase their stability and resilience and, where appropriate, propose approaches to managing health crises.
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 Learning Outcomes M1.1, M1.2, M1.3, M1.4, M1.5, M2.1, M2.2, M2.3, M2.4, M2.5, M3.2;, M3.4, M3.5, M3.7, M3.8, M4.1, M4.2, M4.3, M4.7, M6.2, M6.4, M6.5, M6.6, M6.7, M6.8, M7.1. At the end of this activity, the student is able to: - identify the different plant species, realize vegetation surveys (Braun-Blanquet method or transect) and determine the forest type and origin in relation with soil and biogeography constraints; - analyse vegetation surveys with adequate statistics, realize a synthetic table, defend and argument its choices and vegetation types; - integrate vegetation type and history, sylvo-agro practices, biogeography and climate to propose habitat management; - understand the basics of site assessment; - use the range of tools available for site characterization (*e.g.* phytosociology, afforestation guides, ...) for proper management; - understand the regulation of flows (energy, light, water, nutrients, carbon) in forest ecosystems by integrating theoretical and practical examples presented in this course, in order to derive (i) the impact of forests on the environment and (ii) appropriate management options; - consider abiotic risks in forest management by controlling the underlying processes and integrating the concepts of forest multifunctionality, in order to minimize the impacts of these hazards on forests ecosystems with a long-term vision.
Evaluation methods	The main evaluation is a written exam during the exam session on a theoretical development, specific or transverse. Part of the evaluation will also be done through an individual report to write on a specific subject, partly during the quadrimester and partly during the exam session.
Teaching methods	The course takes the form of a lecture (requiring a face-to-student), accompanied by active learning mini-activities (guided and Review, recurring quiz) and concrete examples and news. According to the news and opportunities, guest speakers are participating in this course.
Content	1. Forest health - concepts: - disturbances / hazards, risk, exposure, sensitivity, vulnerability/ stability, resistance, resilience - diebacks vs diseases: conceptual approaches (triangle of disease, Postulates of Koch, Bradford Hill, Manion) - interactions between abiotic and biotic factors and examples - diagnostic tools and management strategies / intervention thresholds: "specific risk" oriented approaches and systemic approaches 2. Abiotic factors 2.1. Energy, water, nutrients and carbon flows in forest ecosystems Cycles and interaction between cycles 2.2. Impact of abiotic factors on the functioning and health of forest ecosystems - extreme temperatures, frost and heatwave

	- water supply: water deficit and hypoxia - nutritional risks: deficit and excess - winds 3. Biotic factors affecting forest health: 3.1. Pathogens - diversity of pathogens and diseases and their symptoms - typical examples illustrating diagnostic methods, the parasitic cycle, epidemiology of diseases, risk factors, means of control and control. 3.2. Pests (insects, mites, nematodes, etc.) - diversity of species and damage - typical examples illustrating development cycles, interactions with other agents, means of control and control. 4. Monitor and manage forest health 4.1. Belgian and European legislation related to plant health - high-risk plants, priority pests, quarantine organisms or regulated pests outside of quarantine, emergency measures, passport for plants. 4.2. Monitoring systems and alert networks - forest monitoring and indicators - surveillance (eg sentinel nurseries, CRAw public bodies, OWSF, etc.) 4.3. Impacts, prevention and control: - basic principle: reduce exposure to risk, increase stability and resilience - impacts of the disappearance of a woody species (economic, social, cultural, landscape, etc.) 4.4. Examples of health crisis management and ecosystem restoration
Inline resources	Moodle
Bibliography	- les supports de cours obligatoires (diapositives power point, syllabus, documents de référence) sont mis à disposition de l'étudiant·e sur Moodle ; - pour en savoir plus, l'étudiant·e pourra consulter utilement les ouvrages de référence suivants : Barnes, B.V., Zak, D.R., Denton, S.R., Spurr, S.H. 1998. Forest ecology. 4th ed. John Wiley & Sons, New York, USA, 774 p. Binkley, D., Fisher, R.F. 2013. Ecology and management of forest soils, 4th ed. Wiley-Blackwell, (…) Chapin III, F.S., Matson, P. A., Vitousek, P.2011. Principles of terrestrial ecosystem ecology. Springer, New York, USA, 436 p . Jabiol, B., Lévy, G., Bonneau, M., Brêthes, A. 2009. Comprendre les sols pour mieux gérer les forêts. Contraintes et fragilités des sols, choix des essences, précautions sylvicoles, améliorations. AgroParis Tech ENGREF, Nancy, France, 624 p. Kimmins, J.P. 2004. Forest ecology. A foundation for sustainable forest management and environmental ethics in forestry. 3rd edition. Prentice Hall, Upper Saddle River, USA, 611 p. + annexes Larcher, W. 2003. Physiological plant ecology. Ecophysiology and stress physiology of functional groups. 4th ed. Springer, Berlin, 513 p. Sinclair, W.A., Lyon, H.H. 2005. Diseases of trees and shrubs. 2nd edition. Comstock Publishing Associates, Ithaca, USA, 616 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		