2021-2022

FOREST PEST AND DISEASE MANAGEMENT

GESTÃO INTEGRADA DE PRAGAS E DOENÇAS FLORESTAIS

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FOREST PEST AND DISEASE MANAGEMENT

Why ?

➔ gain an understanding of the concepts of **Forest Health and Protection** and the **Strategies** that are employed in the practical application of these concepts

➔ understand the influence of forest **Management** and other human activities on forest health

➔ gain an appreciation for the integration of the perspectives of **Forest Entomology** and **Pathology**

COURSE OBJECTIVES: Students will

✓ Know and understand the ecology of forest pests and diseases, including host-plant interaction, population dynamics, natural enemies and antagonists of insects and pathogens.

✓ Know and understand the evaluation methods of pest and disease incidence in forest ecosystems: monitoring, forecasting and assessing the risk of insect outbreaks and pathogens epidemics.

✓ Recognize the cultural, silvicultural, physical, biological, biotechnical and chemical strategies for preventing, controlling and managing forest pests and diseases.

✓ Understand the economic and ecological impacts of the different control strategies to cope with forest pests and diseases and evaluate them in terms of benefits and costs.

✓ Be able to present written and oral management solutions for insect and disease case-studies.

General Course Outline

- ✓ **Topic 1.** Ecological principles of forest health and protection
- ✓ **Topic 2.** Monitoring and forecasting forest pests and diseases
- ✓ **Topic 3.** Preventive and prophylactic measures
- ✓ **Topic 4.** Forest health management – an integrated perspective
- ✓ **Topic 5.** Impact estimation of pest and disease management strategies

Day	Subject	Prof.
28-Set	Introduction to the course. Program, bibliography and evaluation methods. Ecological fundamentals of disease management: the health status of the tree/forest versus the functions and value of the forest Disease parameters and Epidemiological models. Monocyclic, polycyclic and polyethical diseases.	PR/ MB
30-Set	Diseases and diversity: density, competition, succession: Janzen-Connoll hypothesis and "The Red Queen hypothesis". Emerging pathogens in the forest: entry, establishment and dissemination processes.	PR
05-Out	Holiday	
07-Out	Infectious process and plant resistance mechanisms. Short and long-term pest and disease resistance strategies. Reading of scientific articles	PR
12-Out	Detection and monitoring of forest pests and diseases. Definition of risk at stand and individual tree level. Causality and degree models.	PR
14-Out	Detection and monitoring of forest pests and diseases. Case Study. Assessment (mini-test)	PR
19-Out	Pest and Disease Protection Strategies Prevention of pests and diseases: Legislative measures. Exotic pests and diseases. Quarantine and Embargoes Legislation. Invited Researcher from DGAV	PR
21-Out	Chemical Control in forest environment: historical evolution. Composition, formulation and application of insecticides and fungicides. Ecological and public health impacts, safety standards.	PR
26-Out	Products approved in Portugal for forest plantations and forest products. Application techniques and materials.	PR
28-Out	Convidado dos Laboratórios do INIAV (Oeiras)	PR
02-Nov	Assessment (mini-test)	PR

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04-Nov	Ecological fundamentals of pest management: Dynamics of pest populations. Regulatory mechanisms. "Bottom-up" and "top-down" effects. Population cycles.	MB
09-Nov	Ecological fundamentals of pest management (cont). Implications of climate change for forest pests. Critical reading of scientific articles.	MB
11-Nov	Biological invasions. Ecological and economic impacts. The invasion process: entry, establishment and dispersion. Management strategies. Invasive forest species in national and European territory.	MB
16-Nov	Forestry and cultural measures as strategies to prevent pests and diseases. Preventive forestry.	MB
18-Nov	Forest Health Operational Program. Invited Researcher from ICNF.	MB
23-Nov	Strategy and national action in the scope of pinewood nematode (PWN), role and performance of phytosanitary inspectors in the prevention and control of forest pests. Invited Researcher from ICNF.	MB
25-Nov	Genetic control measures. Seminar – INIAV's Invited Researcher - Isabel Carrasquinho: Selection of maritime pine for pinewood nematode tolerance. Assessment (mini-test with consultation of the texts and articles available).	MB
30-Nov	Genetic control measures. Seminar – INIAV's Invited Researcher – Rita Costa: Castanea sp. and Pinus sp. – genetic improvement program against biotic stresses.	PR
02-Dez	Biological Control. Biotic agents. Strategies for the use of biotic agents in pest control: Classic biological control; bioinsecticides; augmentative release; conservation biological control.	MB
07-Dez	Biotechnological Control of Insect Pests: definition and use of semiochemicals.	MB
09-Dez	Integration of Pest and Disease Management in Forest Management.	JGB
14-dez	Biological and genetic control methods in Eucalyptus plantations. Seminar – ALTRI-Florestal or RAIZ Invited Researcher.	MB
16-Dez	Assessment (mini-test with consultation of the texts and articles available). Presentation and discussion of works.	PR/ MB

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- We will not strictly adhere to this schedule, rather, we will use it as a general list of topics to be covered and may spend more time on certain topics than others.
- Please take part in days with Invited Researchers !!!
- The schedule of classes (topics to be covered) and supporting literature will be available online.

Assessment

Assessment	
Mini-Tests (4)	**60 %**
WORK: Study-case and Oral presentation *	**40%**
Classes with invited researchers are compulsory	
Minimum grade for mini-tests Minimum grade for Work	**9,0 values (out of 20)**
Final Grade at the discipline ≥ 10,0 values	
All students should do and present the Work. *Students with < 10,0 values ➔ Final Exam*	

* *Students should choose the subject of the Work from the Syllabus of the discipline, prepare a Presentation of max. 10 min (with power point support) and deliver a Summary of the work (including References).*

WORK *some examples … but you can suggest others*

1. The relevance of monitoring in disease/pest management: when, how and why to monitor (presentation of a case study)
2. Cost-benefit analysis in pest/disease management: a case study
3. Effects of climate change on the incidence of forest diseases/pests (a specific case)
4. Exotic pathogens and forest diseases - A case study
5. Invasive plant species as forest weeds - A case study
6. Exotic insects as forest pests - A case study
7. Biological Control - advantages and drawbacks (case study)
8. Chemical Control: how effective can it be? (case study)
9. Chemical Control: assessment of impacts on non-target species (one case study)
10. Geographic information systems and monitoring of forest pests/diseases: case presentation
11. Transgenic forest plants, will they be a future in pest/disease control?
12. Selection of trees for resistance to pests or diseases: a case study

WORK

(a) the work must focus on the study of a case (you can use one or two articles concerning a given problem and explore the subject from a specific point of view)

(b) the final title of the work must be communicated in the class of 04/November/2021

(c) only 2 works per subject will be accepted

(d) the work will be presented orally (with powerpoint support or equivalent, 10 minutes) and an extended abstract should be delivered by mail before the presentation-day (max. 1000 words, including the list of bibliographic references).

General expectations

- Come to all classes (on time), and participate actively.
- Do the readings before class. For each reading write down at least 3 take-home messages and at least 1 question about something you didn't understand or disagree with. We try to use lectures to clarify, complement, and extend the readings, not repeat them.
- Interrupt us if we are going too fast or are unclear.
- Any time you need help or have interesting ideas about forest diseases you'd like to discuss ➔ **Paula Ramos's office hours: Tuesdays, 11 a.m. – 11.30 a.m. / Fridays 2 a.m. – 3 a.m.** **(by appt. please)**
- Follow up on what interests you, and use your resources. There is a good selection of books on forest protection in library. If you don't already know how, learn to use the Web of Science (http://apps.webofknowledge.com/). Doing a web search through Google or your favorite web search engine will NOT get you to the articles listed in these databases.
- Work together (except on quizzes and exams). This is not a competition. Learn and enjoy.

Reference texts

- ❑ There is no teaching text available to support this course.
- ❑ However, the following books will serve as reference texts in support of some portions of the lecture materials.
- ❑ Lecture materials will be available at the web page of the course

- ✓ Castello, JD, Teale, SA 2011. Forest Health. An integrative Perspective. Cambridge University Press. Cambridge, UK.
- ✓ Edmonds, RL, Agee, JK, Gara, RI 2000. Forest Health and Protection. McGraw-Hill Companies.
- ✓ Wainhouse, D 2005. Ecological Methods in Forest Pest Management. Oxford University Press Inc., USA.

Additional references:

- ✓ Agrios, GN 2005. Plant Pathology. 5th ed., Academic Press, Inc., San Diego, USA.
- ✓ Manion, PD 1991. Tree Disease Concepts. 2nd ed., Prentice Hall, USA.
- ✓ Speight, MR, Wainhouse, D 1989. Ecology and Management of Forest Insects. Oxford University Clarendon Press, USA.