GHENT
UNIVERSITY

Wildland Fire Behavior and Modelling (E900545)

Course size *(nominal values; actual values may depend on programme)*

Credits 6.0   **Study time 180 h**

Course offerings in academic year 2023-2024

A (semester 1)   English   Gent

Lecturers in academic year 2023-2024

Planas, Eulalia   BARCEL03   lecturer-in-charge

Offered in the following programmes in 2023-2024	crdts	offering
International Master of Science in Fire Safety Engineering	6	A

Teaching languages

English

Keywords

Wildfire dynamics, fire metrics, fuel models, rate of spread models, fire danger, extreme wildfire

Position of the course

The course provide students with fundamental knowledge on wildfires. The aim is that students should be able to understand different wildfire behaviour modelling approaches and apply rate of spread models and simulation systems after the completion of the course. Furthermore, students should be able to identify parameters responsible of different types of wildfire dynamics.

Contents

1 Introduction. Fire in the Earth System – Types of wildfires – Climate and human drivers – Ecological feedbacks.

2 Wildfire propagation. Factors influencing wildland fire behaviour: Terrain – Weather variables – Fuel properties. Fire spread and growth.

3 Fuel types and models: Intrinsic and extrinsic vegetation fuel parameters – Fuel modelling approaches and scales.

4 Geometrical and physical characteristics of wildland fires: fire perimeter – fire behaviour metrics – flame metrics.

5 Mathematical fire behaviour and danger modelling: modelling approaches (empirical, semi-empirical, physical and hybrid approaches), simulation systems, fire danger rating.

6 Extreme fire behaviour: Types of extreme wildfire events – causes and conditions associated to extreme fires – wildfire disasters.

Initial competences

Insight into the basic concepts of physics, chemistry, thermodynamics, heat and mass transfer. Gather, look up, interpret, integrate and present relevant information in a systematic manner.

Final competences

1 Identify the main drivers and parameters linked to wildfire behaviour.

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3 Compare different landscape and weather scenarios in terms of expected wildfire behaviour.

4 Utilize mathematical models to calculate fire behaviour and danger metrics.

5 Critically reflect on the benefits and limitations of wildfire simulation systems.

Conditions for credit contract

This course unit cannot be taken via a credit contract

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Group work, Seminar, Lecture, Practical, Independent work

Extra information on the teaching methods

- Theory and exercises are taught during lectures, periodic individual assignments, case studies in groups.
- Laboratory exercises are performed at the UPC fire laboratory and with computers

Learning materials and price

All material needed can be found digitally on the course web (for free)

References

- Pyne, S. J., Andrews, P.L., Laven, R.D. Introduction to wildland fire, John Wiley and Sons, Ltd. 1996
- Johnson, E.A., Miyanishi, K. Fires fires: behaviour and ecological effects Academic Press, 2001.
- Belcher, C.M. Fire phenomena and the earth system: an interdisciplinary guide to fire science John Wiley & Sons, Ltd. 2013.
- Rego, F.C., Morgan, P, Fernandes, P., Hoffman, C. Fire Science – from chemistry to landscape management. Springer, 2021.

Course content-related study coaching

Interactive support through the electronic learning environment, in person after agreement on date and immediately before and after hearing classes.

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment with multiple-choice questions, Written assessment with open-ended questions

Examination methods in case of periodic assessment during the second examination period

Written assessment with multiple-choice questions, Written assessment with open-ended questions, Written assessment

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

The examination of the course consists of three parts: A written mid-term exam, a written final exam and the continuous assessment.

Calculation of the examination mark

30% mid-term exam, 40% final exam, 30% coursework

Facilities for Working Students

There are no special facilities for working students