

**SYLLABUS**

# **Fire dynamics I 7.5 credits**

## **S0003B**

**Branddynamik I**

**Course syllabus admitted: Autumn 2023 Sp 1 - Present**

DECISION DATE  
**2023-06-02**

# Fire dynamics I 7.5 credits S0003B

## Branddynamik I

### First cycle, S0003B

<b>Education level</b>	<b>Grade scale</b>	<b>Subject</b>	<b>Subject group (SCB)</b>
First cycle	G U 3 4 5	Brandteknik	Building Technology

## Entry requirements

In order to meet the general entry requirements for first cycle studies you must have successfully completed upper secondary education and documented skills in English language and 60 university course credits that include at least 7.5 credits physics

## Selection

The selection is based on 1-165 credits.

## Course Aim

Knowledge and understanding

*After completing the course, the student should be able to*

- define the theoretical research and background to fire development
- define the impact of different types of ventilation and wind conditions on fire development
- explain the application areas for different methods for calculating temperatures, mass flow and velocities in the plume, as well as explaining the limitations for the methods
- explain pressure profiles in fire conditions

Skills and abilities

*After completing the course, the student should be able to show the ability to:*

- compute heat release rate, mass flows in plumes, and flame heights
- compute pressure forces created at constant volume and constant pressure
- compute mass flows into and out from an enclosure fire
- compute fire gas temperatures and estimate a temperature-time curve for fully developed fires
- in written explain the choice of models and assumptions in analysis of fire development
- plan, perform, analyse, and interpret results from fire experiments (laboration) in a pedagogical and scientific way in English
- work and collaborate in teams

Judgement and attitude

*After completing the course, the student should be able to:*

- Show ability for assessing the suitability of different models' applicability in different types of problems

## Contents

The course content can be summarized in the following points:

- General about enclosure fires
- The different stages of a room fire
- Heat release rate and mass loss rate for different types of fires and fuels: Time dependent heat release rate. Alpha-t2 fire growth, the influence of the room on the heat release rate, development of a heat release rate curve
- Mass flows in plumes, and flame heights: mean flame height, flame height correlations, ideal plume, strong and weak plumes, plume correlations, ceiling jets. Selection of appropriate plume model
- Calculation of pressure forces. Pressure profiles. Background to mass flows in buildings. Bernoulli's equation. Ideal gas law. Different types of pressures. Calculation of pressure, velocity and mass flows through openings. Graphical visualization of pressure difference in enclosure fires.
- Temperature conditions in enclosure fires. Fire gas temperature. Energy balance, heat transfer coefficient, correlations for calculating fire gas temperatures. Fully developed fires, flashover, calculating of temperature with different models

## Realization

Each course occasion's language and form is stated and appear on the course page on Luleå University of Technology's website.

The teaching consists of lectures, self-studies, tutorials, quizzes and assignments. The background and theory is presented and exemplified at the lectures.

Training in computations is obtained:

- individually in tutorials
- individually in quizzes
- in group (laboration report)

In the laboration the students apply theory and assess the fire properties of combustible materials. In the laboration the students are trained in planning, performing and evaluating experiments, as well as in written in English report the method, analysis and results in a report. The students will also peer-review the report of another group.

## Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.

The course consists of two parts:

- Written examination with grading G U 3 4 5.
- Assignment part consisting of several quizzes (individual) and laboration report (in group). In order to pass the assignment part it is required that the students participate actively at the laboration. Grading is G U.

## Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term "unauthorized aids" refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

## Overlap

The course S0003B is equal to ABS127

1000

## Course offered by

Department of Civil, Environmental and Natural Resources Engineering

## Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0001	Written exam	G U 3 4 5	4.5	Mandatory	A07	
0002	Assignment	U G#	3	Mandatory	A07	

## Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

## Last revised

by Assistant Director of Undergraduate Studies Eva Gunneriusson, Department of Civil, Environmental and Natural Resources Engineering 2023-06-02

## Syllabus established

Kursplanen är fastställd av Institutionen för samhällsbyggnad 2007-01-31 att gälla från H07.