



# Wood material science

**INTRODUCTION 10.1.2023**

CHEM-E2225 5 cr

# Welcome!



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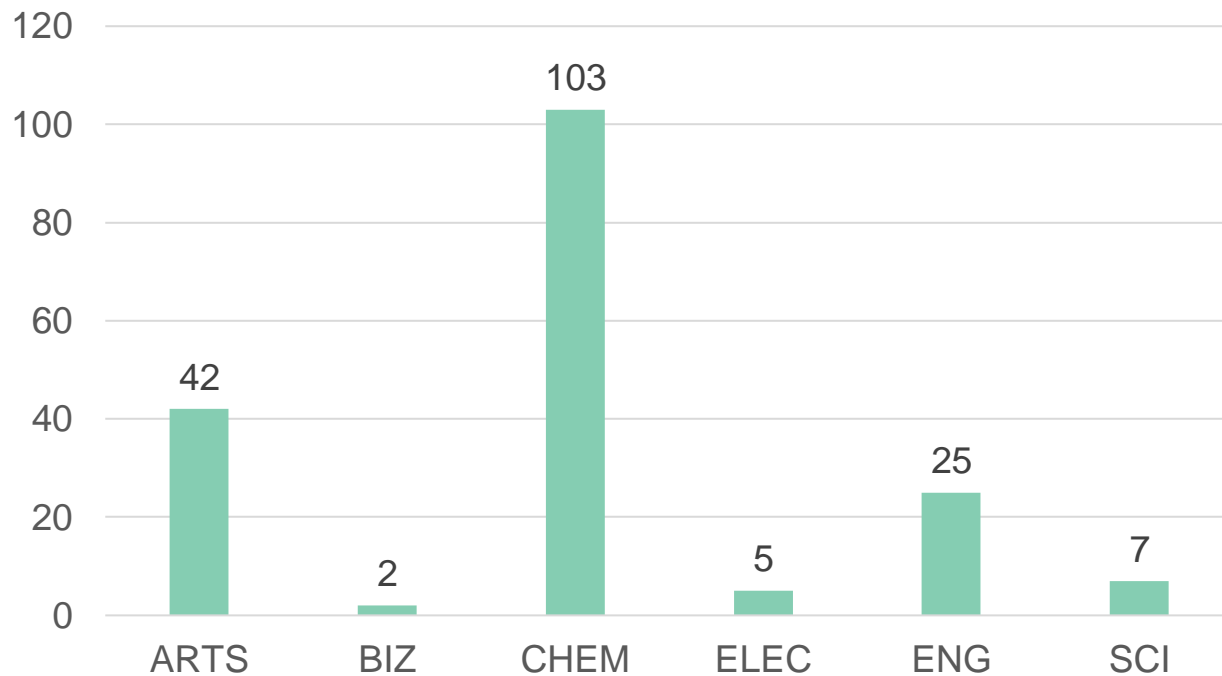
Wood material technology & Wood material science  
Department of Bioproducts and Bioprocesses  
School of Chemical Engineering

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# Students by department

9.1.2023

Altogether **184** students



# Wood material science

ONLINE

course

Students will learn about the formation and structure of wood, as well as its physical and mechanical properties.

The course explains how the structure of wood affects its physical and mechanical properties, as well as describing factors that affects its durability.

10.1.–14.2.2023

For students in all fields  
Proceed at own pace!

Registration in  
Sisu by 16.1.2023

Course description and  
registration in Sisu:



# After the course, students know...

- the **key anatomical features** of wood and can identify wood species from their microstructures
- the **anisotropic nature** of wood and be able to describe how the anatomical structure of wood **affects its physical and mechanical properties**.
- how **moisture** affects the mechanical and physical properties of wood
- anatomical factors influencing wood **density**
- some of the thermal, acoustic, electrical and combustion **properties** of wood
- the short-term and the long-term **mechanical behavior** of wood and how structure/anatomy, density and moisture affect these
- the key **degrading** organisms that are responsible for the breakdown of wood



# How to pass the course?

*Tue 10.1.2023 at 10:15 Introduction @Zoom*

- 1. Study the material at Aalto MyCourses workspace**
  - Practice with all the 10 online quizzes (100% correct)
- 2. Do the 3 online exams in the workspace**
  - The exams you may do only once
- 3. DL Sun 12.2.2023**
- 4. Give feedback in MyCourses**

*Tue 14.2.2023 at 10:15 Closing @Zoom*

*Participation to intro + closing sessions recommended (not compulsory)*

→ **Grading 0-5 (scale determined later)**



# Course info in MyCourses



CHEM-E2225 - Wood Material Science, Lecture, 10.1.2023-14.2.2023

Participants

Grades

Sections

» COURSE INFO

» Forest and trees

» Fundamentals

» Wood properties

» EXAMS

Dashboard

CHEM-E2225 - Wood Material Science, Lecture, 10.1.2023-14.2.2023

Dashboard / My own courses / chem-e2225 - ...

## COURSE INFO

The course is organized as **online course**. You may follow the course **independently** whenever it is suitable for you during the III period / 2023. The course includes reading materials, short videos, exercises and online exams. Teaching language is English.

# All materials in MyCourses

## Sections

- » COURSE INFO
- » Forest and trees
- » Fundamentals
- » Wood properties
- » EXAMS

“Interactive book”



HSP

Forest and harvested products

Mark as done



Image by Mark Hughes

“Quiz”

100% correct  
unlimited attempts



QUIZ

QUIZ: Forest and harvested products

Receive a grade

Receive a pass grade



# Plan ahead!

- DL 12<sup>th</sup> Feb (23:59)
- < 5 weeks, start today!
- Make your own schedule
- Don't leave exams at the last minute!

## SECTIONS

### LEARNING MATERIAL

**Interactive Books:** ✓  
Learning material with some exercises. Mark as **completed** by yourself.

**Quizzes:** ✓  
Exercise questions related to the topic. To **complete** the quiz you need to answer *everything correctly*.

Unlimited attempts  
No time limitation  
**Not graded**



**Exam:**  
The exam are available once you have completed the interactive books and the quizzes of the section.

One attempt  
Time limitation  
**Graded**

#### Forest and trees



1) Forest and harvested products



2) The tree

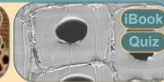
#### Forest and trees Exam

20 %

#### Fundamentals



1) Wood anatomy and microstructure



2) The wood cell



3) Softwood and hardwood anatomy



4) Wood water relation

#### Fundamentals Exam

40 %

#### Wood properties



1) Physical properties



2) Short-term mechanical properties



3) Long-term mechanical properties



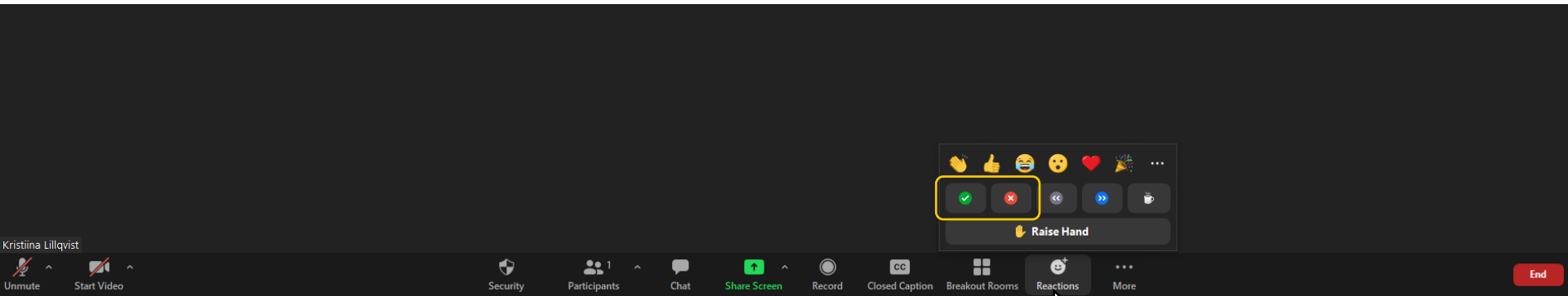
4) Wood degradation

#### Wood properties Exam

40 %

# Yes / no questions!

- To start learning process
- Does not influence your grade
- Use yes / no –buttons in Zoom



# Most of the cells in a growing tree are dead?



YES

Most of the cells are dead

*Only the cambium layer and  
parenchyma cells in sapwood are alive*



NO

Most of the cells are alive



# Softwoods have a more complex cell structure than hardwoods?



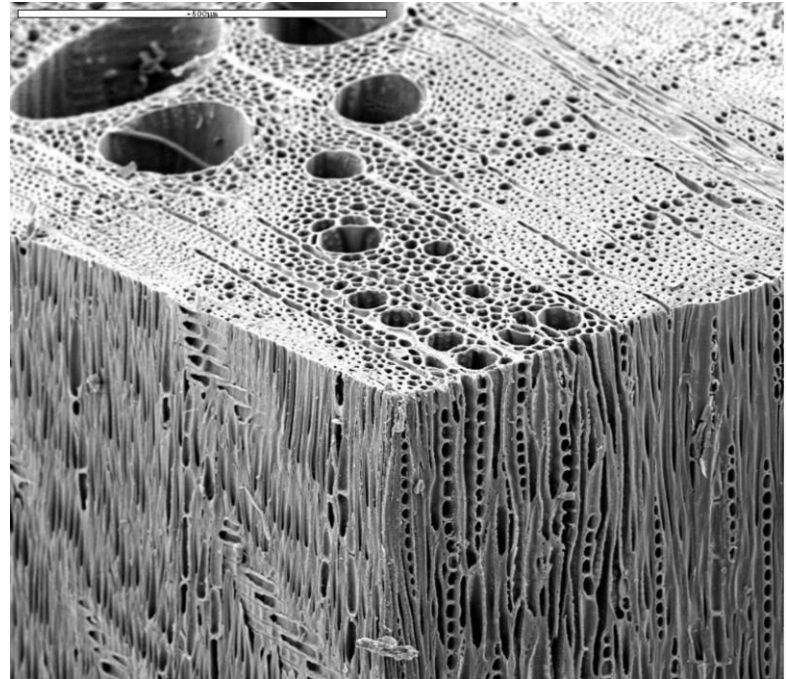
YES

Softwood cell structure is more complex.



NO

Hardwood cell structure is more complex.



**A wet wood sample and dry wood sample are brought to the same room condition. After some time, they will have the same moisture content?**



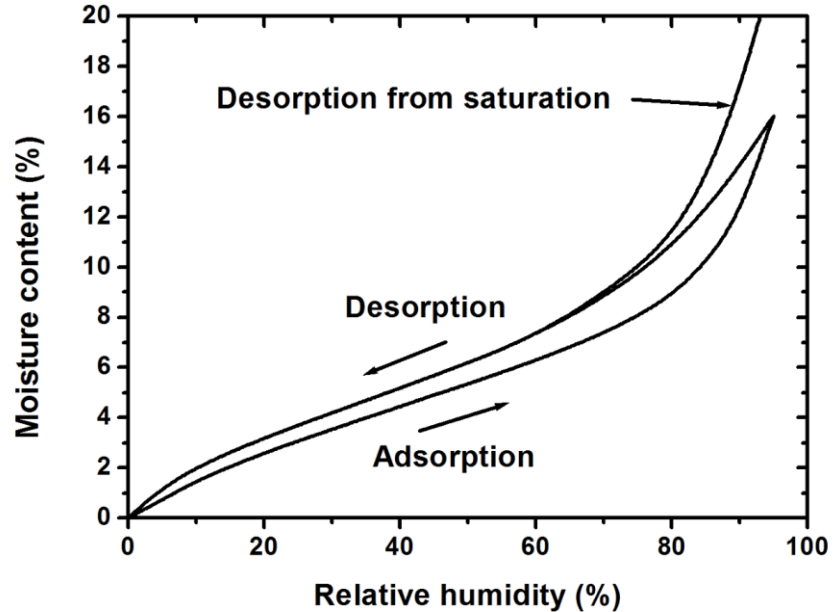
**YES**

Moisture content is the same.



**NO**

Moisture content is different.



# Thermal conductivity for concrete is about 1.7 (W/m.K). That of wood is lower?



YES

Wood thermal conductivity is lower



NO

Wood thermal conductivity is higher

Material	Thermal conductivity (W/m.K)
Air	0.024
Balsa (across the grain)	0.055
Wood perpendicular to grain (white pine)	0.12
Hardwood	0.16
<b>Insulating materials</b>	0.035 to 0.16
Epoxy	0.35
Brick	0.69
Concrete	1.7
Carbon steel	54
Copper	401

# Questions / comments?

wood-teaching@aalto.fi

- Are you able to find MyCourses –page?
- Can you find and access the interactive books?

Videos available on Youtube:

What is wood (13) Water transportation

Aalto University

200-400 litres

100m

2-3 MPa

20-30 MPa

COHESION WATER TENSION

0.1-0.5 MPa

10m

0.6m

3:31 / 3:45

Scroll for details

Aalto University - Wood Science